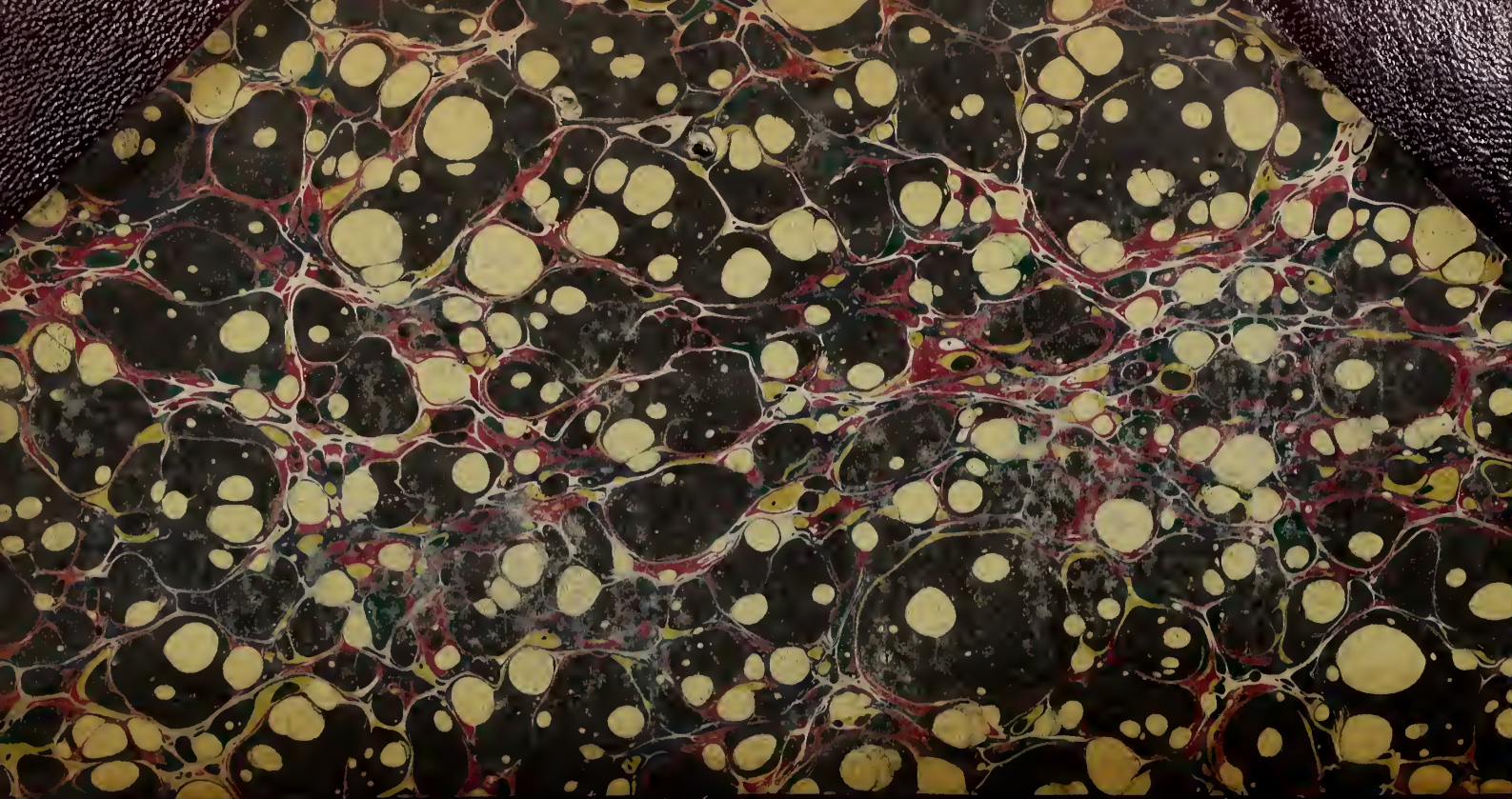

JOURNAL

OF THE

ASIATIC SOCIETY

OF

BENGAL.

EDITED BY

THE SECRETARY AND SUB-SECRETARY.

VOL. XIII.

PART I.—JANUARY TO JUNE, 1844.

Nos. 145 to 150.

NEW SERIES.

"It will flourish, if naturalists, chemists antiquaries, philologers, and men of science, in different parts of *Asia* will commit their observations to writing, and send them to the Asiatic Society, in Calcutta; it will languish if such communications shall be long intermitted; and will die away if they shall entirely cease."—SIR WM. JONES.

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1844.

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TO PART I, VOL. XIII.

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—o—

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By an oversight, the list of Members of the Society intended for the present No. was published with No. CXLIV. Another is now given, and the former one may be cancelled.

LIST OF MEMBERS

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Wallis, Rev. A.
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White, Major M. G.

Young, Lieut. C. B.

Rules of the Asiatic Society.

The following is an abstract of the rules of this Institution which are now in force, including those printed in the Appendix to the sixth and subsequent volumes of the Society's Transactions.

Original Rules adopted from the Founder's Discourse, 15th February, 1784.

1.—The Institution shall be denominated the Asiatic Society, the bounds of its investigations will be the Geographical limits of Asia, and within these limits its enquiries will be extended to whatever is performed by man or produced by nature.

2.—Weekly Meetings shall be held for the purpose of hearing Original Papers read on such subjects as fall within the circle of the Society's enquiries.

3.—All curious and learned men shall be invited to send their Tracts to the Secretary, for which they shall immediately receive the thanks of the Society.

4.—The Society's Researches shall be published Annually, if a sufficiency of valuable materials be received.

5.—Mere Translations of considerable length shall not be admitted, except of such unpublished Essays or Treatises as may be transmitted to the Society, by Native Authors.

6.—All questions shall be decided on a Ballot, by a Majority of two-thirds, and nine Members shall be required to constitute a Board for such decisions.

7.—No new Member shall be admitted who has not expressed a voluntary desire to become so, and in that case, no other qualification shall be required, than a love of knowledge, and a zeal for the promotion of it.

Subsequent Resolutions of the Society which are in force.

8.—The future Meetings of the Society shall be held on the first Wednesday of each month; at half-past Eight o'clock in the Evening.

9.—If any business should occur to require intermediate Meetings, they may be convened by the President, who may also, when necessary, appoint any other day of the week, instead of Wednesday for the stated Meetings of the Society.

10.—As it may not always be convenient for the President to attend the Meetings of the Society a certain number of Vice Presidents shall be elected annually.

11.—In case the President, and the Vice Presidents are absent at any Meeting, a quarter of an hour after the fixed time, the senior Member present shall take the Chair for the Evening.

12.—Every Member of the Society shall have the privilege of introducing as a visitor, any gentleman who is not usually resident in Calcutta.

13.—With a view to provide funds for the necessary expenses of the Society, an Admission Fee shall be established to consist of two gold mohurs, payable by every Member on his election, and each Member of the Society, resident in India (Honorary Members excepted) shall also contribute a gold mohur, quarterly, in the first week of January, April, July and October. Any Member neglecting to pay his Subscription for half a year, after it becomes due, to be considered as no longer a Member of the Society.

14.—All Members returning to India shall be called upon to pay their Subscription as usual from the date of their return.

15.—A Treasurer shall be appointed.

16.—In addition to the Secretary, an Assistant Secretary and a Librarian shall also be appointed.

17.—A Committee of Papers shall be appointed, to consist of the President, Vice Presidents, Secretary, and nine other Members to be elected annually, and any number no less than five, shall be competent to form a Committee.

18.—This Committee will select from the papers communicated to the Society, such as may appear proper for publication, and superintend the printing of the Society's Transactions.

19.—The Committee of Papers shall be authorized to draw upon the Treasurer for any sums requisite to defray the expense of publishing the Translations, and an order signed by a Majority of the Committee, will be a sufficient warrant to the Treasurer for paying the same.

20.—The Committee of Papers is authorized to defray any small contingent expenses on account of the Society which they may deem indispensable.

21.—Every Subscribing Member of the Society, on application, shall be furnished with a copy of such volumes of the Researches as may be published whilst he continues a Member, in return for his contributions, without any further payment.

22.—With a view to the more general circulation of the Asiatic Researches in India, the price of the 12th and future volumes, to Non-subscribers, shall be fixed at a gold mohur, and if several volumes of different years be purchased together, they shall be sold at 10 rupees each.

23.—The Agents of the Society in England shall be desired to purchase, and forward for the Society's Library, Books of Science and Oriental Literature, published in Europe, taking care that those purchases at no time exceed the funds arising from the sale of the Society's publications.

24.—The Committee of Papers shall be requested to furnish the Agents in Europe with such further instructions as may appear requisite for their guidance in the selection of books proper to be placed in the Library of the Society.

Library.

25.—The Library is open from 10 to 4 o'clock, between which hours, the Assistant Librarian is to be in attendance every day, Sunday excepted.

26.—None but the Members of the Society are allowed to borrow Books from the Society's Library, and no book is to be lent out of Calcutta without especial permission from the Committee of Papers.

27.—Books are to be borrowed by written or personal application to the Secretary; in either case, the person applying is to furnish a written receipt specifying the name of the work, and the time for which it is borrowed, at the expiration of which he is to return the book borrowed, or renew his application for an extended loan of it.

28.—The receipts for the Books shall be filed, and a Record kept of the Books lent out, to whom, and when lent out, and when returned.

29.—A list of the Books in the Library, and a Register of those lent out, are to be kept ready for inspection.

30.—All persons borrowing Books are to be answerable for their safe return, or are expected to replace them if injured or lost.

31.—The Librarian should be authorized to call in any work which is detained beyond the time fixed by the preceding rule.

32.—All works borrowed from the Library, should be returned once a year, viz. the first of October, in order to enable the Librarian to have the most efficient control over them, and to report to the Secretary on the state of the Library.

33.—Valuable manuscripts should not be removed from the Library, and no work from the Oriental division of the Library can be borrowed by Native gentlemen, not Members of the Society without a special order of the Secretary.

34.—All books being books of general or special reference in the various branches of Natural History in the departments of the Zoological, Geological, and Mineralogical Curators, to be understood by the Librarian to be Books of reference for the use of those officers, and as such, not to be lent out of the Library.

35—The Curators are farther to be allowed to take over for daily use, such Books as they may select for that purpose, giving the usual receipt to the Librarian.

Museum.

34.—On the 2nd February 1814, the Society determined upon forming a Museum for the reception of all articles that may tend to illustrate Oriental Manners and History, or to elucidate the particulars of Nature or Art in the East. The following Resolutions were at the same time passed upon the subject.

35.—That this intention be made known to the public, and that contributions be solicited of the undermentioned nature:—

1. Inscriptions on stone and brass.
2. Ancient Monuments, Mahomedan or Hindoo.
3. Figures of the Hindoo Deities.
4. Ancient Coins.
5. Ancient Manuscripts.
6. Instrumeuts of War peculiar to the East.
7. Instruments of Music.
8. The vessels employed in Religious Ceremonies.
9. Implements of Native Art and Manufacture, &c. &c.
10. Animals peculiar to India, dried or preserved.
11. Skeletons, or particular bones of animals peculiar to India.
12. Birds peculiar to India, stuffed or preserved.
13. Dried Plants, Fruits, &c.
14. Mineral or Vegetable preparations in Eastern Pharmacy.
15. Ores of Metals.
16. Native alloys of Metals.
17. Minerals of every description, &c. &c. &c.

36.—That the hall on the ground floor of the Society's house be fitted up for the reception of the articles that may be procured. The plan and expenses of so doiug to be regulated by the Committee of Papers and Secretary, and the person under whose superintendence the Museum may be placed.

37.—That the expense which may be incurred in preparing materials furnished in a state unfit for preservation be defrayed by the Society within a certain and fixed extent.

38.—All articles presented to the Museum shall be delivered in the first instance, to the Superintendent of the Museum, to enable him to make the acknowledgment, directed in the standing rules of the Society.

39.—A Register of Donations to the Museum, shall be exhibited each Meeting of the Society.

40.—The Committee of Papers shall adopt such means as may appear proper for making the intentions of the Society, in this respect, generally known.

41.—That the names of persons contributing to the Museum or Library of the Society, be hereafter published at the end of each volume of the Asiatic Researches.

Bibliotheca Asiatica.

The following Resolutions were passed on the recommendation of the Committee of Papers, under date the 2nd July 1806, but materials have not yet been received for publishing a volume of the work therein proposed.

42.—That the Society publish from time to time as their funds will admit of it volumes distinct from the AsiaticResearches, translations of short works in the Sanscrit and other Asiatic Languages, or extracts and descriptive accounts of books of greater length in those languages, which may be offered to the Society, and appear deserving of publication.

43.—That as this publication may be expected gradually to extent to all Asiatic books of which copies may be deposited in the Library of the Society, and even to all works extant in the learned languages of Asia, the series of the volumes, be entitled Bibliotheca Asiatica, or a Descriptive Catalogue of Asiatic Books with extracts and translations.

Physical Class.

The following Resolutions were passed on the 2nd January 1828:—

1.—That the Physical Committee of the Asiatic Society be considered as in existence and for the same purposes as formerly, exclusively of Medicine.

2.—That all Members of the Society, be Members of the Committee.

3.—That persons not belonging to the Society, may be elected as corresponding Members of the Committee, upon the recommendation of any three Members without being liable to any charge.

4.—That the Committee elect its own Officers.

5.—That the Committee frame its own rules, subject whenever likely to interfere with the Rules of the Society, to confirmation at a General Meeting.

6.—That the proceedings of the Society, and short notices of any interest, be published from time to time, as they accumulate, in such form as may be hereafter found convenient.

7.—That Papers of any extent or permanent interest, be published in the same type and form as the Researches, so as to admit of their being bound up with them.

8.—That the expense of these publications be borne by the Society.

9.—That the Physical department of the Museum be considered under the especial charge of the Committee, Mr. Tytler undertaking the care of the Osteological Specimens and Mr. Ross of the Minerals.

Translation Committee, 3rd September, 1828.

That a Committee of the Society be formed to communicate with the Committee of Translation of the Royal Asiatic Society, and carry their views into effect by procuring and transmitting such Manuscripts, Originals and Translations, as they may be able to obtain for the purpose.

That a Book be opened for Subscriptions of Ten Guineas per annum, each Subscriber; entitling him to a Copy of all the Works printed by the Translation Committee.

Oriental Publications for Sale, at REDUCED *prices, by the Asiatic Society.*

WORKS.	Rs.	Former Price.
Mahábhárata, vol. 1st. pages 831, vol. 2d, pages 868, vol. 3rd, pages 859, vol. 4th, pages 1007, royal 4to.	40	48
Large paper do. do.	50	61
Index to the 4 vols. of the Mahabharut complete.	6	0
Harriwansa, 563 pages, royal 4to.	5	6
Rája Taranginí, 440 pages, 4to.	5	20
Large paper, do. do.	8	12
Naishada, 917 pages, 8vo.	6	6
Sausruta, 1st vol. 378 pages, 2d vol. 562 pages, 8vo.	8	8
Fátawé A'lemgíri, 1st vol. 763 pages, 2d vol. 759 pages, 3d vol. 565 pages, 4th vol. 759 pages, 5th vol. 697 pages, 6th vol. 667 pages, royal 4to. per vol. ...	8	10
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Anis ul Musharrahin, 541 pages, 4to.	5	5
Sharaya-ool-Islam, 631 pages, 4to.	8	15
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Tibetan Dictionary, 373 pages. 4to.	10	12
Asiatic Researches, per vol.	10	12
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Burnouf Commentaire sur le Yacna, with notes &c. 2 parts, pp 945.	10	0

	Rs.	As.
Burnouf et Lassen, Essai sur le Pali, ou Langue Sacrée de la presqúile au de lá du Gange. Paris, 1826, pages 222, 8vo.	3	0
Elèmens de la Grammaire Japonaise, par M. M. Rodriguez et Remusat. Paris, 1825, pages 158, 8vo.	3	0
Ditto ditto Supplément. Paris, 1826, pages 31, 8vo.		
Contes Arabes, traduits par J. J. Marcel. Paris, 1835, avec notes, vol. I. pages 484, vol. II. pages 496, vol. III. pages 508, 8vo.	3	0
Brosset, Elémens de la Langue Georgienne. Paris 1837, pages 122, 8vo. ...	5	0
Klaproth, Vocabulaire et Grammaire de la langue Georgienne. Paris, 1827, pages 232, 1st part, 8vo.	4	0
Cronique Georgienne, traduite par M. Brosset, Text and Translation. Paris, 1830, pages 370, 8vo.	3	0
Choix de Fables de Vartan, en Arménien et en Francais. Paris, 1825, pages 96, 8vo.	1	8
Elegie sur La Prise D'Edesse, en Arménien. Paris 1828, pages 112, 8vo. ...	2	0
Chrestomathie Chinoise—Chinese Characters, 1833, pages 183, 4to.	5	0
Meng-Tseu, texte Chinoise, pages 161, 8vo.	3	0

Oriental Publications for Sale, at REDUCED *prices, by the Asiatic Society.—(Continued.)*

	Rs.	As.
Meng-Tseu, traduction Latine, par S. Julien. Lutetiæ Parisiorum, 1824, pages 593, 8vo.	6	0
Lassen, Institutiones Linguæ Pracriticæ. Bonnæ ad Rhenum, 1837, pages 167, 8vo.	6	0
Lassen, Antbologia Sanscritica. Bonnæ, 1838, pages 371, 8vo.	4	0
Lassen, Gita Govinda, Sanscrit et Latine. Bonnæ ad Rhenum, 1836, pages 180, 4to.	2	8
Chezy, Yajnadattabada, ou La Mort D'yadjnadatta, Text, Analysis and Translation. Paris, 1826, pages 142, 4to.	3	8
Chezy, La reconnaissance de Sacountala, Text and Translation. Paris, 1830, pages 665, 4to.	10	0
Geograpbie D'Aboulféda, Texte Arabe. Paris, 1837-40, pages 586, 4to. ...	5	0
The Travels of Ibn Batuta, translated from the Arabic Manuscript, by S. Lea. London 1829, 143 pages, 4to.	6	0
The Travels of Macarius, translated by F. C. Belfour. London, 1829, pt. I. 114 pages, 4to.	4	0
Memoir of the Emperor Jehanguire, translated from tbe Persian Manuscript, by Major D. Price. London, 1829, 141 pages, 4to.	4	0
History of the Afghans, translated from the Persian, by B. Dorn, part I. London, 1829, 184 pages, 4to.	5	0
Han-Koong-Tsew, or the Sorrows of Han, a Chinese Tragedy, translated by J. F. Davis. London, 1829, 28 pages, 4to.	1	8
Vocabulary of Scinde Language, by Capt. Eastwick.	1	0
Leachs Grammar and Vocabulary of the Baloochi and Punjabee Languages. ...	1	0

JOURNAL

OF THE

ASIATIC SOCIETY.

Tables for determining the Elastic Force of Aqueous Vapour in the Atmosphere and the Temperature of the Dew-point, by Observations of a dry and wet bulb Thermometer; computed agreeably to Dr. Apjohn's *Hygrometric formula, under the direction of Capt.* J. T. Boileau, *of the Bengal Engineers,* F.R.S., F.R.A.S. *Superintendent of the Hon'ble E. I. Company's Magnetic Observatory at Simla.*

The formula of Dr. Apjohn, according to which the elastic force of the aqueous vapour contained in the atmosphere is deduced from the observed temperature of a dry and wet bulb Thermometer freely exposed to evaporation, was first given in the Transactions of the R. I. Academy for 1835, but as a more complete exposition of the theory by which the general expression has been obtained is given in a "Note on the value of the Numerical Co-efficient in the Hygrometric formula applied to the observations of the dry and wet bulb Thermometer," by Dr. Apjohn, published with some remarks by Professor Lloyd in the Proceedings of the R. I. Academy for 1840, it will only be necessary to notice the latter paper.

The following assumed data, form the basis of Dr. Apjohn's investigations:—

1. That the specific heat of air, and the caloric of elasticity of aqueous vapour are constant, and represented within ordinary variations of atmospheric temperature and pressure, the former by the number ·267, the latter by ·1115.

2. That where a dry and moist bulb Thermometer are exposed to the influence of the same atmosphere, when the latter has obtained a stationary temperature, the caloric which vaporizes the water is equal to that which the surrounding gas evolves in descending through that number of degrees at which the moist bulb stands below the dry, *i. e.* from the proper temperature of the air to that of the moist bulb.

3. That the air so cooled by the successive contacts with the moistened bulb is saturated with humidity.

If now a represent the specific heat of air,

e the latent heat of aqueous vapour,

t and t' the observed temperatures of a dry and wet bulb Thermometer encompassed by atmospheric air

t'' the observed temperature of the dew-point,

f and f'' the elastic forces of aqueous vapour at t and t'

p the existing pressure in inches and decimals,

30 a standard Barometer pressure in inches,

then the general expressions for the force of atmospheric vapour at the temperature of the dew-point in terms of the force of vapour at t' and of the difference of the temperatures of the wet and dry Thermometer are where t' is greater than 32° Faht.

$$f''=f'-\frac{48\ a\ (t-t')}{e}\times\frac{p-f'}{30} \quad .. \quad \text{(I)}$$

and where t' is less than 32 F.

$$f''=f'-\frac{43\ a\ (t-t')}{e}\times\frac{p-f'}{30} \quad .. \quad \text{(II)}$$

in which by substituting for a, the value assumed above ·267 and for e its value at 50° upon the hypothesis that ·967 is the latent heat of vapour at 212° and that the sum of the sensible and latent heat is at every temperature a constant quantity.

Equation (I) becomes

$$f''=f'-\cdot01135\ (t-t')\times\frac{p-f'}{30} \quad - - \quad \text{(III)}$$

and Equation (II) becomes

$$f''=f'-\cdot01017\ (t-t')\times\frac{p-f'}{30} \quad - - \quad \text{(IV)}$$

In the above equations, however, the value of the co-efficient (m) depends upon the assumed values of a and e which, Dr. Apjohn remarks, are in all probability not yet known with great precision, and accordingly he proceeds to deduce values for the co-efficient (m) in the general equation directly from experiment in three separate ways as follows; viz.

1. By observations in air, in reference to which t and t' had been accurately noted, the temperature of which was afterwards raised and the observations repeated; the value of f'' is here constant for both observations.

2. By observations of t and t' in perfectly dry air where the value of f'' is of course $= o$.

3. By observations in air saturated with moisture, where f'' is obtained from a simple observation of the temperature, and in which after its temperature has been raised, the values t and t' were observed.

From the above experiments, using Anderson's Table of the elastic force of vapour, Edinburgh Encyclopedia, Art. "Hygrometer," three separate values of (m) are obtained; viz.

1st Series,	11 observations	$m = \cdot01151$
2nd Ditto,	19 ditto	$\cdot01150$
3rd Ditto,	24 ditto	$\cdot01140$
The Arithmetical mean of which is		$\frac{1}{87\cdot18}$ or $\cdot01147$

The most probable value of the final mean, as deduced by Professor Lloyd, according to the calculus of probabilities, from the means of all three values of m is $\cdot01145$, but since in the second series the result is affected by the full tabular error in the value of f, whereas in the 1st and 3rd series as m is expressed in terms of the difference of two values of f, the tabular error will not sensibly affect the result. Professor Lloyd considers that the second series should be omitted, and combining the results of the 1st and 3rd series by the same method, obtains for the value of m $\cdot01145$.

As my object in the construction of the accompanying Tables has been solely to enable observers to apply Dr. Apjohn's formula, without

being obliged to go through the labour of computing the value of f for each observation, I have, for the information of those who may not have had an opportunity of perusing his papers on the Dew-point, given in the above a brief sketch of the steps by which the Hygrometric formula has been obtained, and shall now proceed to explain the manner in which the same has been applied to the computation of the accompanying tables.

The equation which I have adopted is

$$f'' = f' - .01147\ (t - t') \times \frac{p - f'}{30}$$

in which as the co-efficient employed is the arithmetical mean of the three values of m given above, and not the most probable value, as computed by Professor Lloyd, a reason will be expected for the adoption of this number.

The Table of the elastic force of vapour which I have used for giving the values of f' that enter into the computation of the second term in the right hand member of the equation, has been computed specially for this purpose by Biot's formula, "Traite de Physique, 1816, Tome 1, p. 278."*

This Table differs so little from that employed by Dr. Apjohn, computed by Anderson from the experiments of Dalton and Ure, that as this latter has been shewn by Professor Lloyd to be more probably accurate, within the ordinary limits of observation, than either the table of Kaïntz, or that adopted by the Royal Society in the report of their Physical Committee, the employment of the Table which I have computed, will not materially affect the resulting values of the Dew-point tension or temperature.

By means of this Table, and with the three series of experiments

* This formula, which is deduced from experiments by Dalton, is as follows :—

Log Ff = Log $30 + af + bf^2 + cf^3$

The numerical values of the co-efficients are

$a =$	$-.00854121972$	Log.	$\bar{3}.9315199$
$b =$	$-.00002081091$	,,	$\bar{5}.3182910$
$c =$	$+.00000000580$	,,	$\bar{9}.7634280$

f being the number of degrees of Fahrenheit reckoned from 212° positively below, and negatively above that point.

given in Dr. Apjohn's "Note," I have computed the following values of the co-efficient m; viz.

1st Series,	11 observations,	..	$m = \cdot01155$
2nd Ditto,	19 ditto,	..	„ ·01156
3rd Ditto,	24 ditto,	..	„ ·01143

and adopting the same method as was pursued by Professor Lloyd, referred to above, the most probable value of the final mean obtained by combining all three of the values of m is .. .. ·01150

The same value by Anderson's tables, (see above,) .. ·01145

The mean of which, being the co-efficient adopted, is ·01147

Combining the means of the 1st and 3rd series, the most probable value of m is .. .. ·01120

The following table will serve to shew, that the tabular error is not nearly constant within the ordinary limits of the temperature of observation when the computed values of the tension are carried out to more than three places of decimals, and it is on this account that the value of m deduced by the second series of experiments has not been omitted, or rather that the final value of the co-efficient as obtained by a combination of all three values of m has been adopted.

Table of the Elastic Force of Aqueous Vapour, according to the experiments of Dalton, and as computed by Biot's formula.

Degrees Fahrenheit.	Tension of Vapour.		Computed value ± Experiment.
	By Dalton's Experiment.	By Biot's Formula.	
32°	0·200	0·19917	—·00083
43°25	0·297	0·29582	—·00018
54°50	0·435	0·43481	—·00019
65°75	0·630	0·63239	+·00239
77	0·910	0·91001	+·00001
88°25	1·290	1·29551	+·00551
99°5	1·820	1·82433	+·00433
110°75	2·540	2·54097	+·00097
122°	3·500	3·50003	+·00003

If the numerical values in the right hand member of the equation were computed as it is written, it is evident that the values of f''

would be obtained by the simple subtraction of two tabular numbers; but since p and f' are both variable, and the possible number of different readings of each within the limits of observation is very great, the former being recorded in inches and thousandths, the latter in degrees and tenths of Fahrenheit's scale, the adoption of such an arrangement would not only have very much enhanced the labour of computation, but would have swelled the table to a very inconvenient size. Accordingly as regards this term, the table has been separated into two parts; the first part (Table I) contains the values of $.01147\ (t-t') \times \frac{p}{30}$ which have been computed for all values of $(t-t')$ to tenths of a degree of Fahrenheit's Thermometer between 0° and 30° and for a range of pressure between 20 and 31 inches, the full numerical values being given for whole inches of pressure, and the proportional parts (which can be taken out to ·001 of an inch) in separate columns: the second part (Table II) contains the corrections necessary on account of the quantity $-f'$ omitted in the above computations, and which being comparatively small, are given only for single degrees for values of $t-t'$ between 1° and 30°, and for a range of t' between 10° and 129° the numbers in this table were computed for depressions of 1° Fahrenheit and for all the values of t' corresponding thereto, and the numbers for higher depressions being simple multiples of the value of $t-t' = 1°$ have been obtained in this manner, *i. e.* by multiplication. Table III contains the elastic force of aqueous vapour or values of f' for every degree and tenth part between $\overset{-}{0}2{\cdot}9^{\circ}$ and $\overset{+}{1}45{\cdot}9^{\circ}$ of Fahrenheit's Thermometer, and in this table each number has been computed directly by the formula above-mentioned.

It may at first sight appear, that the tables have been extended unnecessarily, both as regards their range and the numerical value of the entries, but the depressions at this station have compelled their extension to values of $(t-t') = 30°$ Faht. and if the computed numbers had been carried out in Table I, to less than 5 places of decimals, they would not have exhibited, with sufficient precision, the variations of the elastic force of vapour due either to the tenth part of a degree of Fahrenheit's Thermometer, or to several thousandths of an inch of pressure; this number of figures in the decimal places has therefore necessarily been retained: the range of temperature has been taken to include all possible contingencies.

A single example will suffice to render the use of the Tables familiar.

Example.—Required the elastic force of vapour in the atmosphere and the temperature of dew-point, the observed temperature of a dry bulb Thermometer being 49° 58 F. of a wet bulb Thermometer 36° 65, F. and the height of the Barometer 23·278 inches.

Here $(t-t') = 49°58-36°65 = 12°93$

Enter Table I, and under the nearest depression 12°9 take out the numbers corresponding to the height of the Barometer; viz.

for 23·000 ins.	0·11344
·200 „	99
070 „	34
008 „	4

which gives the value of $\cdot01147\ (t-t') \times \frac{p}{30}$ = for 23·278 ins. = 0·11481

Correction for f Table II, for 12°9 and 36·6 (always negative) — 115

(*a*) .. .. .. $\cdot01147\ (t-t') \times \frac{p-f'}{30}$ = .. diff. 0·11366

(*b*) f' from table III for 36°6 0·23444

$(a\text{-}b) = f'' = f' - \cdot01147\ (t-t') \times \frac{p-f'}{30}$ = ... diff. 0·12078

which gives for t'' the temperature of dew-point 18° 17, F.

By Anderson's Table, going through the computations for this example, we should have obtained f'' = 0·12106

and t'' = 18°20 Fahrt.

When however the wet bulb Thermometer stands below 32° Fahrt. the quantity a in the foregoing example requires to be corrected for the difference of the co-efficient above and below the freezing point; it will suffice for all practical purposes, to subtract from the number a, obtained as above, its $10\frac{1}{300}$th part, the remainder taken from the tabular value of f' will give the tension of atmospheric vapour and deduced temperature of the dew-point as before: to prevent misapprehension an example is given.

Example 2nd.—Required the tension of the atmospheric vapour and the deduced temperature of the dew-point for the following observations of a dry Thermometer 28°5 F. wet bulb do. 23°7, Fahrt. and Barometer 23·104 inches.

Here $(t—t') = 4°.8$; enter Table I, under this head, and take out numbers as follows, for

	23·000 ins.	·04221
	·100	·18
	·004	·1
01147, $(t—t') \times \frac{p}{30}$ for,	23·104	·04240
Correction for f' (Table II) for 4°.8 and 23°.7		·27
$(a) = ·01147\ (t—t') \times \frac{p—f'}{30}$		04213
$a/10$	·00421	
$a/300$	·00014	Sum 435
(a) Corrected for reading of wet bulb below 32°=diff.		·03778
f' (Table III) for 23°.7		·14779
$f'' =$		·11001
$t'' =$		15°.7

The computed value of f'' using the co-efficient for values of t' below 32° F. would have been ·11003, and the difference in the temperature of the dew-point from the approximate value obtained above, is not equal to the 200th of a degree of Fahrenheit.

J. T. Boileau.

TABLE I,—*Apjohn's Hygrometric Tables.*

Barom. Inches.	Decls. Inches.	(t.—t.′)=00°. (t—t′) p. 87.18 × 30	Parts for Decls. Inches.	(t—t′) p. 87.18 × 30	Parts for Decls. Inches.	(t—t′)=01°. (t—t′) p. 87.18 × 30	Parts for Decls. Inches.	(t—t′) p. 87.18 × 30	Parts for Decls. Inches.	Decls. Inches.	Barom. Inches.
		00		0.°5		1.°0		1.°5			
20				.00382		.00765		.01147			20
21	.1			.00401	2	.00803	4.	.01204	6.	1	21
22	.2			.00420	4	.00841	8.	.01262	11.	.2	22
23	.3			.00440	6	.00879	11.	.01319	17.	.3	23
24	.4			.00459	8	.00918	15.	.01376	23.	.4	24
25	.5			.00479	10	.00956	19.	.01434	29.	.5	25
26	.6			.00497	11	.00994	23.	.01491	34.	.6	26
27	.7			.00516	13	.01032	27.	.01548	40.	.7	27
28	.8			.00535	15	.01071	31.	.01606	46.	.8	28
29	.9			.00554	17	.01109	34.	.01663	52.	.9	29
30				.00574		.01147		.01721			30
31				.00593		.01185		.01778			31
		0.°1		0.°6		1.°1		1.°6			
20		.00076		.00459		.00841		01223			20
21	.1	00080	0	00482	2	.00883	4	01285	6	1	21
22	.2	00084	1	00505	5	.00925	8	01346	12	2	22
23	.3	00088	1	00528	7	.00967	13	01407	18	3	23
24	.4	00092	2	00551	9	.01009	17	01468	24	4	24
25	.5	00096	2	00573	11	.01051	21	01529	31	5	25
26	.6	00099	2	00596	14	.01093	26	01591	37	6	26
27	.7	00103	3	00619	16	.01136	29	01652	43	7	27
28	.8	00107	3	00642	18	.01178	34	01713	49	8	28
29	.9	00111	3	00665	21	.01220	38	01774	55	9	29
30		00115		00688		.01262		01835			30
31		.00118		00711		.01304		01896			31
		0.°2		0.°7		1.°2		1.°7			
20		.00153		.00535		00918		01300			20
21	1	00161	1	00562	3	00963	5	01365	7	1	21
22	2	00168	2	00589	5	01009	9	01430	13	2	22
23	3	00176	2	00616	8	01055	14	01495	20	3	23
24	4	00183	3	00642	11	01101	19	01560	26	4	24
25	5	00191	4	00669	13	01147	23	01625	33	5	25
26	6	00199	5	00696	16	01193	28	01690	39	6	26
27	7	00206	5	00723	19	01239	33	01753	46	7	27
28	8	00214	6	00749	21	.01285	37	01820	52	8	28
29	9	00222	7	00776	24	01331	42	01885	59	9	29
30		00229		00803		01376		01950			30
31		00237		00830		01422		02015			31
		0.°3		0.°8		1.°3		1.°8			
20		00229		.00612		00994		01376			20
21	1	00241	1	00642	3	01044	5	01445	7	1	21
22	2	00252	2	00673	6	01093	10	01514	14	2	22
23	3	00264	3	00703	9	01143	15	01583	21	3	23
24	4	00275	5	00734	12	01193	20	01652	28	4	24
25	5	00287	6	00765	15	01243	25	01721	34	5	25
26	6	00298	7	00795	18	01292	30	01789	41	6	26
27	7	00310	8	00826	21	01342	35	01858	48	7	27
28	8	00321	9	00856	24	01392	40	01927	55	8	28
29	9	00333	10	00887	28	01441	45	01996	62	9	29
30		00344		00918		01491		02065			30
31		00356		00948		01541		02133			31
		0.°4		0.°9		1.°4		1.°9			
20		00306		.00688		01071		01453			20
21	1	00321	2	00723	3	01124	5	01526	7	1	21
22	2	00336	3	00757	7	01178	11	01598	15	2	22
23	3	00352	5	00791	10	01231	16	01671	22	3	23
24	4	00367	6	00826	14	01285	21	01743	29	4	24
25	5	00382	8	00860	17	01338	27	01816	36	5	25
26	6	00398	9	00895	21	01392	32	01889	44	6	26
27	7	00413	11	00929	24	01445	37	01961	51	7	27
28	8	00428	12	00963	28	01499	43	02034	58	8	28
29	9	00443	14	00998	31	01552	48	02107	65	9	29
30		00459		01032		01606		02179			30
31		00474		01067		01659		02252			31

TABLE I,—*Apjohn's Hygrometric Tables —(Continued.)*

Barom. Inches.	Decls. Inches.	(t.—t.′)=02°. (t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	(t.—t.(=03°. (t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	Decls. Inches.	Barom. Inches.
		2.°0		2.°5		3.°0		3.°5			
20		.01529		.01912		.02294		.02676			20
21	1	.01606	7	.02007	10	.02409	11	.02810	13	.1	21
22	2	.01682	15	.02103	19	.02523	23	.02944	27	.2	22
23	3	.01759	22	.02199	29	.02638	34	.03078	40	.3	23
24	4	.01835	30	.02294	38	.02753	46	.03212	54	.4	24
25	5	.01912	37	.02390	48	.02868	57	.03346	67	.5	25
26	6	.01988	45	.02485	57	.02982	69	.03479	80	.6	26
27	7	.02065	52	.02581	67	.03097	80	.03613	94	.7	27
28	8	.02141	60	.02676	76	.03212	92	.03747	107	.8	28
29	9	.02218	67	.02772	86	.03326	103	.03881	120	.9	29
30		.02294		.02868		.03441		.04015			30
31		.02371		.02963		.03556		.04148			31
		2.°1		2.°6		3.°1		3.°6			
20		.01606		.01988		.02370		.02753			20
21	1	.01686	8	.02088	10	.02489	12	.02891	14	1	21
22	2	.01766	16	.02187	20	.02608	24	.03028	28	2	22
23	3	.01847	24	.02286	30	.02726	36	.03166	41	3	23
24	4	.01927	32	.02386	40	.02845	47	.03303	55	4	24
25	5	.02007	40	.02485	50	.02963	59	.03441	69	5	25
26	6	.02088	48	.02585	60	.03082	71	.03579	83	6	26
27	7	.02168	56	.02684	70	.03200	83	.03716	96	7	27
28	8	.02248	64	.02783	80	.03319	95	.03854	110	8	28
29	9	.02328	72	.02883	89	.03437	107	.03992	124	9	29
30		.02409		.02982		.03556		.04120			30
31		.02489		.03082		.03674		.04268			31
		2.°2		2.°7		3.°2		3.°7			
20		.01682		.02065		.02247		.02791			20
21	1	.01766	8	.02168	10	.02569	12	.02931	14	1	21
22	2	.01851	17	.02271	21	.02692	24	.03070	28	2	22
23	3	.01935	25	.02374	31	.02814	37	.03210	42	3	23
24	4	.02019	34	.02478	41	02936	49	.03349	56	4	24
25	5	.02103	42	.02581	52	.03059	61	.03489	70	5	25
26	6	.02187	50	.02684	62	.03181	73	.03628	84	6	26
27	7	.02271	59	.02787	72	.03303	86	.03768	98	7	27
28	8	.02355	67	.02891	83	.03426	98	.03908	102	8	28
29	9	.02439	76	.02994	93	.03548	110	.04047	126	9	29
30		.02523		.03097		.03671		.04187			30
31		.02608		.03200		.03793		.04326			31
		2.°3		2.°8		3.°3		3.°8			
20		.01759		.02141		.02523		.02906			20
21	1	.01847	9	.02248	11	.02650	13	.03051	15	1	21
22	2	.01935	18	.02355	21	.02776	25	.03196	29	2	22
23	3	.02023	26	.02462	32	.02902	38	.03342	44	3	23
24	4	.02110	35	.02569	43	.03028	50	.03487	58	4	24
25	5	.02198	44	.02676	54	.03154	63	.03632	73	5	25
26	6	.02286	53	.02783	64	.03281	76	.03778	87	6	26
27	7	.02374	62	.02891	75	.03407	88	.03923	102	7	27
28	8	.02462	70	.02998	86	.03533	101	.04068	116	8	28
39	9	.02550	79	.03105	96	.03659	113	.04213	131	9	29
30		.02638		.03212		.03785		.04359			30
31		.02726		.03319		.03911		.04504			31
		2.°4		2.°9		3.°4		3.°9			
20		.01835		.02218		.02600		02982			20
21	1	.01927	9	.02328	11	.02730	13	.03131	15	1	21
22	2	.02019	18	.02439	22	.02850	26	.03281	30	2	22
23	3	.02111	28	.02550	33	.02980	39	.03430	45	3	23
24	4	.02202	37	.02651	44	.03120	52	.03579	60	4	24
25	5	.02294	46	.02772	55	.03250	65	.03728	75	5	25
26	6	.02386	55	.02883	67	03380	78	.03877	89	6	26
27	7	.02478	64	.02994	78	.03510	91	.04026	104	7	27
28	8	.02569	73	.03105	89	.03640	104	·04175	119	8	28
29	9	.02661	83	.03216	100	.03770	117	.04324	134	9	29
30		.02753		.03325		.03900		.04473			30
31		.02847		.03437		.04030		.04623			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom.		(t.—t.′)=04°.				(t.—t.′)=05°.				Barom.	
Inches.	Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	Decls. Inches.	Inches.
		4.°0		4.°5		5.°0		5.°5			
20		03059		03441		03823		04206			20
21	1	03212	15	03613	17	04015	19	04416	21	1	21
22	2	03365	31	03785	34	04206	38	04626	42	2	22
23	3	03518	46	03957	52	04397	57	04837	63	3	23
24	4	03671	61	04129	69	04588	76	05047	84	4	24
25	5	03823	76	04301	86	04779	96	05257	105	5	25
26	6	03976	92	04473	103	04970	115	05468	126	6	26
27	7	04129	107	04646	120	05162	134	05678	147	7	27
28	8	04282	122	04818	138	05353	153	05888	168	8	28
29	9	04435	138	04990	155	05544	172	06098	189	9	29
30		04588		05162		05735		06309			30
31		04741		05334		05926		06519			31
		4.°1		4.°6		5.°1		5.°6			
20		03135		03518		03900		04282			20
21	1	03292	16	03693	18	04095	20	04496	21	1	21
22	2	03449	31	03869	35	04290	39	04711	43	2	22
23	3	03606	47	04045	53	04485	59	04925	64	3	23
24	4	03762	63	04221	70	04680	78	05139	86	4	24
25	5	03919	78	04397	88	04875	99	05353	107	5	25
26	6	04076	94	04573	106	05070	117	05367	128	6	26
27	7	04233	110	04749	123	05265	137	05781	150	7	27
28	8	04389	125	04925	141	05460	156	05995	171	8	28
29	9	04546	141	05101	158	05655	176	06209	193	9	29
30		04703		05276		05850		06423			30
31		04860		05452		05945		06638			31
		4.°2		4 °7		5.°2		5.°7			
20		03212		03556		03976		04359			20
21	1	03372	16	03734	18	04175	20	04577	22	1	21
22	2	03533	32	03911	36	04374	40	04795	44	2	22
23	3	03693	48	04089	53	04573	60	05013	65	3	23
24	4	03854	64	04267	71	04772	80	05230	87	4	24
25	5	04015	80	04445	89	04971	99	05448	109	5	25
26	6	04175	96	04623	107	05169	119	05666	131	6	26
27	7	04336	112	04800	125	05368	139	05884	153	7	27
28	8	04496	128	04978	142	05567	159	06102	174	8	28
29	9	04657	145	05156	161	05766	179	06320	196	9	29
30		04818		05334		05965		06538			30
31		04978		05512		06163		06756			31
		4.°3		4.°8		5.°3		5.°8			
20		03288		03671		04053		04435			20
21	1	03453	16	03854	18	04256	20	04657	22	1	21
22	2	03617	33	04038	37	04458	41	04879	44	2	22
23	3	03781	49	04221	55	04661	61	05101	67	3	23
24	4	03946	66	04405	73	04863	81	05322	89	4	24
25	5	04110	82	04588	92	05066	101	05544	111	5	25
26	6	04275	99	04772	110	05269	122	05766	133	6	26
27	7	04439	115	04955	128	05471	142	05988	155	7	27
28	8	04603	132	05139	147	05674	162	06209	177	8	28
29	9	04768	148	05322	165	05877	182	06431	200	9	29
30		04932		05506		06079		06653			30
31		05097		05689		06282		06875			31
		4.°4		4.°9		5.°4		5.°9			
20		03365		03747		04129		04512			20
21	1	03533	17	03934	19	04336	21	04737	23	1	21
22	2	03701	34	04122	37	04542	41	04963	45	2	22
23	3	03869	50	04309	56	04749	62	05188	68	3	23
24	4	04038	67	04496	75	04955	83	05414	90	4	24
25	5	04206	84	04684	94	05162	103	05640	113	5	25
26	6	04374	101	04871	112	05368	124	05865	135	6	26
27	7	04542	118	05058	131	05575	145	06091	158	7	27
28	8	04711	135	05246	150	05781	165	06316	180	8	28
29	9	04879	151	05433	169	05988	186	06542	203	9	29
30		05047		05620		06194		06768			30
31		05215		05808		06400		06993			31

TABLE I,—*Apjohn's Hygrometic Tables.—(Continued.)*

Barom.		(t.—t.′)=06°.				(t—t′)=07°.				Barom.	
Inches.	Decls. Inches.	(t—t′) p. 87.18 × 30	Parts for Decls. Inches.	(t—t′) p. 87.18 × 30	Parts for Decls. Inches.	(t—t′) p. 87.18 × 30	Parts for Decls. Inches.	(t—t′) p. 87.18 × 30	Parts for Decls. Inches.	Decls. Inches.	Inches.
		6.°0		6.°5		7.°0		7.°5			
20		.04588		04971		05353		05735			20
21	1	.04818	23	05219	25	05620	27	06022	29	1	21
22	2	.05047	46	05468	50	05888	54	06309	57	2	22
23	3	.05276	69	05716	75	06156	80	06595	86	3	23
24	4	.05506	921	05965	99	06423	107	06882	115	4	24
25	5	.05735	115	06213	124	06691	134	07169	143	5	25
26	6	.05965	138	06462	149	06959	161	07456	172	6	26
27	7	.06194	161	06710	174	07226	187	07743	201	7	27
28	8	.06423	184	06959	199	07494	214	08029	229	8	28
29	9	.06653	206	07207	224	07762	241	08316	258	9	29
30		.06882		07456		08029		08603			30
31		.07112		07704		08297		08890			31
		6.°1		6.°6		7.°1		7.°6			
20		.04665		05047		05429		05812			20
21	1	.04898	23	05299	25	05701	27	06102	29	1	21
22	2	.05131	47	05552	50	05972	54	06393	58	2	22
23	3	.05364	70	05804	76	06244	81	06683	81	3	23
24	4	.05598	93	06056	101	06515	109	06974	116	4	24
25	5	.05831	117	06309	126	06787	136	07265	145	5	25
26	6	.06064	140	06561	151	07058	163	07555	174	6	26
27	7	.06297	163	06813	177	07330	190	07846	203	7	27
28	8	.06530	187	07066	202	07601	217	08136	232	8	28
29	9	.06764	210	07318	227	07873	244	08427	262	9	29
30		.06997		07570		08144		08718			30
31		.07230		07823		08415		09008			31
		6.°2		6.°7		7.°2		7.°7			
20		.04741		05213		05506		05888			20
21	1	.04978	24	05380	26	05781	28	06183	29	1	21
22	2	.05215	47	05636	51	06056	55	06477	59	2	22
23	3	.05452	71	05892	77	06332	83	06771	88	3	23
24	4	.05689	95	06148	102	06607	110	07066	118	4	24
25	5	.05926	119	06404	128	06882	138	07360	147	5	25
26	6	.06163	142	06660	154	07158	165	07655	177	6	26
27	7	.06400	166	06917	179	07433	193	07949	206	7	27
28	8	.06638	190	07173	205	07708	220	08243	235	8	28
29	9	.06875	213	07429	231	07903	248	08638	265	9	29
30		.07112		07685		08259		08832			30
31		.07349		07941		08534		09127			31
		6.°3		6.°8		7.°3		7.°8			
20		.04818		05200		05582		05965			20
21	1	.05058	24	05460	26	05861	28	06263	30	1	21
22	2	.05299	48	05720	52	06140	56	06561	60	2	22
23	3	.05840	72	05980	78	06420	84	06859	89	3	23
24	4	.05781	96	06240	104	06699	112	07158	119	4	24
25	5	.06022	120	06500	130	06978	140	07456	149	5	25
26	6	.06263	145	06760	156	07257	167	07754	179	6	26
27	7	.06504	169	07020	182	07536	195	08052	209	7	27
28	8	.06745	193	07280	208	07815	223	08350	239	8	28
29	9	.06985	217	07540	234	08094	251	08649	268	9	29
30		.07226		07800		08373		08947			30
31		.07467		08060		08653		09245			31
		6.°4		6.°9		7.°4		7.°9			
20		.04894		05276		05659		06041			20
21	1	.05139	24	05540	26	05942	28	06343	30	1	21
22	2	.05383	49	05804	53	06225	57	06645	60	2	22
23	3	.05628	73	06068	79	06508	85	06947	91	3	23
24	4	.05873	98	06332	106	06790	113	07249	121	4	24
25	5	.06118	122	06595	132	07073	141	07551	151	5	25
26	6	.06362	147	06859	158	07356	170	07853	181	6	26
27	7	.06607	171	07123	185	07639	198	08155	211	7	27
28	8	.06852	196	07387	211	07922	226	08458	242	8	28
29	9	.07096	220	07651	137	08205	255	08760	272	9	29
30		.07341		07915		08488		09062			30
31		.07586		08178		08771		09364			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom.		(t.—t.′)=08°.			(t.—t.′)=09°.			Barom.
Inches.	Decl. Inches.	(t—t′) p. / 87.18 30	Parts for Decl. Inches.	(t—t′) p. / 87.18 30	Parts for Decl. Inches.	(t—t′) p. / 87.18 30	Parts for Decl. Inches.	Decl. Inches. / Inches.
		8.°0		8.°5		9.°0		9.°5			
20		06118		06500		06882		07265			20
21	.1	06423	31	06825	33	07226	34	07625	36	1	21
22	.2	06729	61	07150	65	07670	69	07991	73	2	22
23	.3	07035	92	07475	98	07915	103	08354	109	3	23
24	.4	07341	122	07800	130	08259	138	08718	145	4	24
25	.5	07647	153	08125	163	08603	172	09081	182	5	25
26	.6	07953	184	08450	195	08947	206	09444	218	6	26
27	.7	08259	214	08775	228	09291	241	09807	254	7	27
28	.8	08565	245	09100	260	09635	275	10170	291	8	28
29	.9	08870	275	09425	293	09979	310	10534	327	9	29
30		09176		09750		10223		10897			30
31		09482		10075		10667		11260			31
		8.°1		8.°6		9.°1		9.°6			
20		06194		06576		06959		07341			20
21	1	06504	31	06905	33	07307	35	07708	37	1	21
22	2	06813	62	07234	66	07655	70	08075	73	2	22
23	3	07123	93	07563	99	08003	104	08442	110	3	23
24	4	07433	124	07892	132	08350	139	08809	147	4	24
25	5	07743	155	08220	164	08608	174	09176	184	5	25
26	6	08052	186	08549	197	09046	209	09543	220	6	26
27	7	08362	217	08878	230	09394	244	09910	257	7	27
28	8	08672	248	09207	253	09742	278	10278	294	8	28
29	9	08981	279	09536	296	10090	313	10645	330	9	29
30		09291		09865		10438		11012			30
31		09591		10193		10786		11379			31
		8.°2		8.°7		9.°2		9.°7			
20		06270		06653		07035		07418			20
21	1	06584	31	06985	33	07387	35	07788	37	1	21
22	2	06898	63	07318	67	07739	70	08159	74	2	22
23	3	07211	94	07651	99	08090	106	08530	111	3	23
24	4	07525	125	07983	133	08442	141	08901	148	4	24
25	5	07838	157	08316	166	08794	176	09272	185	5	25
26	6	08152	188	08649	200	09146	211	09643	223	6	26
27	7	08465	219	08981	233	09498	246	10014	260	7	27
28	8	08779	251	09314	266	09849	281	10385	297	8	28
29	9	09092	282	09647	299	10291	317	10755	334	9	29
30		09406		09979		10553	352	11126			30
31		09719		10312		10995		11497			31
		8.°3		8.°8		9.°3		9.°8			
20		06347		06729		07112		07494			20
21	1	06664	32	07066	34	07467	36	07819	37	1	21
22	2	06982	63	07402	67	07823	71	08243	75	2	22
23	3	07299	95	07739	101	08178	107	08618	112	3	23
24	4	07616	127	08075	135	08534	142	08993	150	4	24
25	5	07934	159	08412	168	08890	178	09368	187	5	25
26	6	08251	190	08748	202	09249	213	09742	225	6	26
27	7	08568	222	09085	236	09691	249	10117	262	7	27
28	8	08886	254	09421	269	09956	284	10492	300	8	28
29	9	09203	286	09758	303	10312	320	10866	337	9	29
30		09520		10094		10668		11241			30
31		09838		10430		11023		11616			31
		8.°4		8.°9		9.°4		9.°9			
20		06423		06806		07188		07570			20
21	1	06745	32	07146	34	07548	36	07949	38	1	21
22	2	07066	64	07486	68	07907	72	08328	76	2	22
23	3	07387	96	07827	102	08266	108	08706	114	3	23
24	4	07708	128	08167	136	08626	144	09085	151	4	24
25	5	08029	161	08507	170	08985	180	09463	189	5	25
26	6	08350	193	08848	204	09345	216	09842	227	6	26
27	7	08672	225	09188	238	09704	252	10220	265	7	27
28	8	08993	257	09528	272	10063	288	10599	303	8	28
29	9	09314	289	09968	306	10423	323	10977	341	9	29
30		09635		10209		10782		11356			30
31		09956		10549		11142		11734			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom.		(t.—t.′)=10°.			(t.—t.′)=11°.			Barom.
Inches.	Decl. Inches.	$\frac{(t-t')\,p.}{87.18\ 30}$	Parts for Decl. Inches.	$\frac{(t-t')\,p.}{87.18\ 30}$	Part for Decl. Inches.	$\frac{(t-t')\,p.}{87.18\ 30}$	Parts for Decl. Inches.	$\frac{(t-t')\,p.}{87.18\ 30}$	Parts for Decl. Inches.	Decl. Inches.	Inches.
		10.°0		10.°5		11.°0		11.°5			
20		.07647		.08029		.08412		.08794			20
21	.1	.08029	38	.08431	40	.08832	42	.09234	44	.1	21
22	.2	.08412	76	.08832	80	.09253	84	.09673	88	.2	22
23	.3	.08794	115	.09234	120	.09673	126	.10113	132	.3	23
24	.4	.09176	153	.09635	161	.10094	168	.10553	176	.4	24
25	.5	.09559	191	.10037	201	.10515	210	.10993	220	.5	25
26	.6	.09941	229	.10438	241	.10935	252	.11432	264	.6	26
27	.7	.10323	268	.10840	281	.11356	294	.11872	308	.7	27
28	.8	.10706	306	.11241	321	.11776	336	.12312	352	.8	28
29	.9	.11088	344	.11643	361	.12097	379	.12751	396	.9	29
30		.11470		.12044		.12618		.13191			30
31		.11853		.12445		.13038		.13631			31
		10.°1		10.°6		11.°1		11.°6			
20		.07723		.08106		.08488		.08870			20
21	.1	.08110	39	.08511	41	.08913	42	.09314	44	.1	21
22	.2	.08496	77	.08916	81	.09337	85	.09758	89	.2	22
23	.3	.08882	116	.09322	122	.09761	127	.10201	133	.3	23
24	.4	.09268	154	.09727	162	.10186	170	.10645	177	.4	24
25	.5	.09654	193	.10132	203	.10610	212	.11088	222	.5	25
26	.6	.10040	232	.10538	243	.11035	255	.11532	266	.6	26
27	.7	.10427	270	.10943	284	.11459	297	.11975	310	.7	27
28	.8	.10813	309	.11348	324	.11883	240	.12419	355	.8	28
29	.9	.11199	348	.11753	365	.12308	382	.12862	399	.9	29
30		.11585		.12159		.12732		.13306			30
31		.11979		.12564		.13157		.13750			31
		10.°2		10.°7		11.°2		11.°7			
20		.07800		.08182		.08565		.08947			20
21	.1	.08190	39	.08591	41	.08993	43	.09394	45	.1	21
22	.2	.08580	78	.09000	82	.09421	86	.09842	89	.2	22
23	.3	.08970	117	.09410	123	.09849	128	.10289	134	.3	23
24	.4	.09360	156	.09819	164	.10278	171	.10736	179	.4	24
25	.5	.09750	195	.10228	205	.10706	214	.11184	224	.5	25
26	.6	.10140	234	.10637	245	.11134	257	.11631	268	.6	26
27	.7	.10530	273	.11046	286	.11562	300	.12078	313	.7	27
28	.8	.10920	312	.11455	327	.11990	343	.12526	358	.8	28
29	.9	.11310	351	.11864	368	.12419	385	.12973	403	.9	29
30		.11700		.12273		.12847		.13420			30
31		.12090		.12683		.13275		.13868			31
		10.°3		10.°8		11.°3		11.°8			
20		.07876		.08259		.08641		.09023			20
21	.1	.08270	29	.08672	41	.09073	43	.09475	45	.1	21
22	.2	.08664	79	.09685	83	.09505	86	.09926	90	.2	22
23	.3	.09058	118	.09494	124	.09937	130	.10337	135	.3	23
24	.4	.09452	158	.09910	165	.10369	173	.10828	180	.4	24
25	.5	.09845	197	.10323	206	.10801	216	.11279	226	.5	25
26	.6	.10239	236	.10736	248	.11233	259	.11730	271	.6	26
27	.7	.10633	276	.11493	289	.11665	302	.12182	316	.7	27
28	.8	.11027	315	.11562	330	.12098	346	.12633	361	.8	28
29	.9	.11421	354	,11975	372	.12530	389	.13084	406	.9	29
30		.11815		.12388		.12962		.13535			30
31		.12208		.12801		.13394		.13986			31
		10.°4		10.°9		11.°4		11.°9			
20		.07953		.08335		.08718		.09100			20
21	.1	.08350	40	.08752	42	.09153	44	.09555	46	.1	21
26	.2	·08748	80	,09169	83	.09589	87	.10010	91	.2	22
23	.3	.09146	119	.09585	125	.10025	131	.10465	137	.3	23
24	.4	.09543	159	.10002	167	.10461	174	.10920	182	.4	24
25	.5	.09941	199	.10409	208	.10897	218	.11375	228	.5	25
26	.6	.10339	239	.10836	250	.11333	262	.11830	273	.6	26
27	.7	.10736	278	.11253	292	.11769	305	.12285	319	.7	27
28	.8	.11134	318	.11669	333	.12205	349	12740	364	.8	28
29	.9	·11532	358	.12086	375	.12640	392	.13195	410	.9	29
30		.11929		.12503		.13076		.13650			30
31		.12327		.12920		.13512		.14105			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom.		(t−t′)=12°.			(t−t′)=13°.			Barom.
Inches.	Decl. Inches.	(t−t′) p. / 87.18 30	Parts for Decl. Inches.	(t−t′) p. / 87.18 30	Parts for Decl. Inches.	(t−t′) p. / 87·18 30	Parts for Decl. Inches.	(t−t′) p. / 87.18 30	Parts for Decl. Inches.	Decl. Inches.	Inches.
		12.°0		12.°5		13.°0		13.°5			
20		.09176		.09559		.09941		.10323			20
21	.1	.09635	46	.10037	48	.10438	50	.10840	52	.1	21
22	.2	.10094	92	.10515	95	.10935	99	.11356	103	.2	22
23	.3	.10553	138	.10993	143	.11432	149	.11872	155	.3	23
24	.4	.11012	184	.11470	191	.11928	199	.12388	206	.4	24
25	.5	.11470	229	.11948	239	.12426	249	.12904	258	.5	25
26	.6	.11927	275	.12426	287	.12923	298	.13420	310	.6	26
27	.7	.12388	321	.12904	335	.13420	348	.13937	361	.7	27
28	.8	.12847	367	.13382	382	.13818	398	.14453	413	.8	28
29	.9	.13306	414	.13860	430	.14415	447	.14969	463	.9	29
30		.13765		.14338		.14912		.15485			30
31		.14223		.14816		.15409		.16001			31
		12.°1		12.°6		13.°1		13.°6			
20		.09253		.09635		.100186		.10400			20
21	.1	.09715	46	.10117	48	.105181	50	.10920	52	.1	21
22	.2	.10178	93	.10599	96	.11019	100	.11440	104	.2	22
23	.3	.10641	139	.11080	145	.11520	150	.11960	156	.3	23
24	.4	.11103	185	.11562	193	.12021	200	.12480	208	.4	24
25	.5	.11566	231	.12044	241	.12522	250	.13000	260	.5	25
26	.6	.12029	278	.12526	289	.13023	301	.13520	312	.6	26
27	.7	.12492	324	.13008	337	.13524	351	.14040	364	.7	27
28	.8	.12954	370	.13489	385	.14025	401	.14560	416	.8	28
29	.9	.13417	416	.13971	434	.14525	451	.15080	468	.9	29
30		.13879		.14453		.15026		.15600			30
31		.14342		.14935		.15527		.16120			31
		12.°2		12.°7		13.°2		13.°7			
20		.09329		.09712		.10094		.10476			20
21	.1	.09796	47	.10197	49	.10599	50	.11000	52	.1	21
22	.2	.10252	93	.10683	97	.11103	101	.11524	105	.2	22
23	.3	.10719	140	.11168	146	.11608	151	.12048	157	.3	23
24	.4	.11185	187	.11654	194	.12113	202	.12572	210	.4	24
25	.5	.11652	233	.12140	243	.12618	252	.13095	262	.5	25
26	.6	.12128	280	.12625	291	.13122	303	.13619	314	.6	26
27	.7	.12595	325	.13111	340	.13627	353	.14143	367	.7	27
28	.8	.13061	373	.13596	388	.14132	404	.14667	419	.8	28
29	.9	.13528	420	.14082	437	.14636	454	.15191	471	.9	29
30		.13994		.14568		.15141		.15715			33
31		.14460		.15053		.15646		.16238			31
		12.°3		12.°8		13.°3		13.°8			
20		.09406		.09788		.10170		.10553			20
21	.1	.09876	47	.10278	49	.10679	51	.11080	53	.1	21
22	.2	.10346	94	.10767	98	.11188	102	.11608	106	.2	22
23	.3	.10817	141	.11256	147	.11696	153	.12136	158	.3	23
24	.4	.11287	188	.11746	196	.12205	203	.12663	211	.4	24
25	.5	.11757	235	.12235	245	.12713	254	.13191	264	.5	25
26	.6	.12228	282	.12725	294	.13222	305	.13719	317	.6	26
27	.7	.12698	329	.13214	343	.13730	356	.14246	369	.7	27
28	.8	.13168	376	.13703	392	.14239	407	.14774	422	.8	28
29	.9	.13638	423	.14193	440	.14747	458	.15302	475	.9	29
30		.14109		.14682		.15256		.15839			30
31		.14579		.15172		.15764		.16357			31
		12.°4		12.°9		13.°4		13.°9			
20		.09482		.09865		.10247		.10629			20
21	.1	.09564	47.	.10358	49	.10759	51	.11161	53	·1	21
22	.2	.10430	95.	.10851	99	.11272	102	.11692	106	.2	22
23	.3	.10905	142.	.11344	148	.11784	154	.12224	159	.3	23
24	.4	.11379	190.	.11838	197	.12296	205	.12755	213	.4	24
25	.5	.11853	237.	.12331	247	.12809	256	.13287	266	.5	25
26	.6	.12327	284.	.12824	296	.13321	307	.13818	319	.6	26
27	.7	.12801	332.	.13317	345	.13833	359	.14350	372	.7	27
28	.8	.13275	379.	.13810	395	.14346	410	.14881	425	.8	28
29	.9	.13749	427.	.14304	444	.14858	461	.15412	478	.9	29
30		.14223		.14797		.15370		.15944			30
31		.14698		.15290		.15883		.16475			31

TABLE I.—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom. Inches.	Decl. Inches.	(t—t′)=14.° (t—t′) p. 87.18 30	Parts for Decl. Inches.	(t—t′) p. 87.18 30	Parts for Decl. Inches.	(t—t′)=15°. (t—t′) p. 87.18 30	Parts for Decl. Inches.	(t—t′) p. 87.18 30	Parts for Decl. Inches.	Decl. Inches.	Barom. Inches.
		14.°0		14.°5		15.°0		15.°5			
20		.10706		.11088		.11470		.11853			20
21	.1	.11241	54	.11643	55	.12044	57	.12445	59	.1	21
22	.2	.11776	107	.12197	111	.22618	115	.13038	119	.2	22
23	.3	.12312	161	.12751	166	.13191	172	.13631	178	.3	23
24	.4	.12847	214	.13306	222	.13765	229	.14223	237	.4	24
25	.5	.13382	268	.13860	277	.14338	287	.14816	296	.5	25
26	.6	.13918	321	.14415	333	.14912	344	.15409	256	.6	26
27	.7	.14453	375	.14969	388	.15485	401	.16001	415	.7	27
28	.8	.14988	428	.15523	444	.16059	459	.16594	474	.8	28
29	.9	.15523	482	.16078	499	.16632	516	.17187	533	.9	29
30		.16059		.16632		.17206		.17779			30
31		.16594		.17169		.17789		.18372			31
		14.°1		14.°6		15 °1		15.°6			
20		.10783		.11165		.11547		11929			20
21	.1	.11322	54	.11723	56	.12124	58	12526	60	.1	21
22	.2	.11861	108	.12281	112	.12702	115	.13122	119	.2	22
23	.3	.12400	162	.12839	167	.13279	173	.13719	179	.3	23
24	.4	.12939	216	.13398	223	.13856	231	.14315	239	.4	24
25	.5	.13479	270	.13956	279	.14434	289	.14912	298	.5	25
26	.6	.14018	323	.14514	335	.15011	346	.15508	358	.6	26
27	.7	.14557	377	.15072	391	.15588	404	.16105	418	.7	27
28	.8	.15096	431	.15630	447	.16166	462	.16701	477	.8	28
29	.9	.15635	485	.16189	502	.16743	520	.17297	537	.9	29
30		.16174		.16747		.17320		.17894			30
31		.16713		.17305		.17898		.18490			31
		14.°2		14.°7		15.°2		15.°7			
20		.10859		.11241		.11623		.12006			20
21	.1	.11402	54	.11803	56	.12205	58	.12606	60	.1	21
22	.2	.11945	109	.12365	112	.12786	116	.13206	120	.2	22
23	.3	.12488	163	.12927	169	.13367	174	.13807	180	.3	23
24	.4	.13030	217	.13489	225	.13948	232	.14407	240	.4	24
25	.5	.13573	271	.14051	281	.14529	291	.15007	300	.5	25
26	.6	.14116	326	.14613	337	.15110	349	.15607	360	.6	26
27	.7	.14659	380	.15175	393	.15692	407	.16208	420	.7	27
28	.8	.15202	434	.15737	450	.16273	465	.16808	480	.8	28
29	.9	.15745	489	.16300	506	.16854	523	.17408	540	.9	29
30		.16288		.16862		.17435		.18009			30
31		.16831		.17424		.18016		.18609			31
		14.°3		14.°8		15.°3		15.°8			
20		.10935		.11318		.11700		.12082			20
21	.1	.11482	55	.11833	57	.12285	59	.12686	60	.1	21
22	.2	.12029	109	.12449	113	.12870	117	.13290	121	.2	22
23	.3	.12575	164	.13015	170	.13455	176	.13895	181	.3	23
24	.4	.13122	219	.13581	226	.14040	234	.14499	242	.4	24
25	.5	.13669	273	.14147	283	.14625	293	.15103	302	.5	25
26	.6	.14216	328	.14713	340	.15210	351	.15707	362	.6	26
27	.7	.14763	383	.15279	396	.15795	410	.16311	423	.7	27
28	.8	.15309	437	.15845	453	.16380	468	.16915	483	.8	28
29	.9	.15856	492	.16410	509	.16965	527	.17519	544	.9	29
30		.16403		.16976		.17550		.18123			30
31		.16950		.17542		.18135		.18727			31
		14.°4		14.°9		15.°4		15.°9			
20		.11012		.11394		.11776		.12159			20
21	.1	.11562	55	.11964	57	.12365	59	.12767	61	.1	21
22	.2	.12113	110	.12533	114	.12954	118	.13375	122	.2	22
23	.3	.12663	165	.13103	171	.13543	177	.13983	182	.3	23
24	.4	.13214	220	.13673	228	.14132	236	.14590	243	.4	24
25	.5	.13765	275	.14243	285	.14720	294	.15198	304	.5	25
26	.6	.14314	330	.14812	342	.15309	353	.15806	365	.6	26
27	.7	.14866	385	.15382	399	.15898	412	.16414	426	.7	27
28	.8	.15416	440	.15952	456	.16487	471	.17022	486	.8	28
29	.9	.15969	496	.16521	513	.17076	530	.17630	547	.9	29
30		.16517		.17091		.17665		.18238			30
31		.17068		.17661		.18253		.18846			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom.		(t.—t.′)=14°.				(t—t′)=15°.				Barom.
Inches.	Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	Decls. Inches.	Inches.
		16.°0		16.°5		17.°0		17.°5			
20		.12235		.12618		.13000		.13882			20
21	.1	12847	61	.13248	63	.13650	65	.14051	67	1	21
22	.2	13459	122	.13879	126	.14300	130	.14720	134	.2	22
23	.3	14070	184	.14510	189	.14950	195	.15390	201	.3	23
24	.4	14682	245	.15141	252	.15600	260	.16059	268	.4	24
25	.5	15294	306	.15772	315	.16250	325	.16728	335	.5	25
26	.6	15906	367	.16403	379	.16900	390	.17397	401	.6	26
27	.7	16517	428	.17034	442	.17550	455	.18066	468	.7	27
28	.8	17129	489	.17665	505	.18200	520	.18735	535	.8	28
29	.9	17741	551	.18295	568	.18850	585	.19404	602	.9	29
30		18353		.18926		.19500		.20073			30
31		18965		.19557		.20150		.20742			31
		16.°1	.....	16.°6	.....	17.°1	.....	17.°6			
20		12312		.12694		.13072		.13459			20
21	.1	12927	62	.13329	63	.13726	65	.14132	67	.1	21
22	.2	.13543	123	.13963	127	.14380	131	.14805	135	.2	22
23	.3	.14158	185	.14598	190	.15033	196	.15175	202	.3	23
24	.4	.14774	246	.15233	254	.15687	262	.16150	269	.4	24
25	.5	.15390	308	.15867	317	.16340	327	.16823	336	.5	25
26	.6	.16005	369	.16502	381	.16994	392	.17496	404	.6	26
27	.7	.16621	431	.17137	444	.17648	458	.18169	471	.7	27
28	.8	.17236	492	.17772	508	.18301	523	.18842	538	.8	28
29	.9	.17852	554	.18406	571	.18955	588	.19515	606	.9	29
30		.18467		.19041		.19609		.20188			30
31		.19083		.19676		.20262		.20861			31
		16.°2	.....	16.°7	.....	17.°2	.....	17.°7			
20		.12388		.12770		.13153		.13535			.20
21	.1	.13008	62	.13407	64	.13810	66	.14212	68	.1	.21
22	.2	.13627	134	.14048	128	.14468	132	.14839	135	.2	.22
23	.3	.14246	186	.14686	192	.15126	197	.15565	203	.3	.23
24	.4	.14866	248	.15325	255	.15783	263	.16246	271	.4	.24
25	.5	.15485	310	.15963	319	.16441	329	.16919	338	.5	.25
26	.6	.16105	372	.16602	383	.17099	395	.17596	406	.6	.26
27	.7	.16724	434	.17240	447	.17756	460	.18272	474	.7	.27
28	.8	.17343	496	.17879	511	.18414	526	.18949	541	.8	.28
29	.9	.17963	557	.18517	575	.19072	592	.19626	609	.9	.29
30		.18582		.19156		.19729		.20303			.30
31		.19202		.19794		.20387		.20980			.31
		16.°3	.....	16.°8	.....	17.°3	.....	17.°8			
20		.12465		.12847		.13229		.13612			20
21	.1	.13088	62	.13493	64	.13891	66	.14292	68	.1	21
22	.2	.13711	125	.14132	128	.14552	132	.14973	136	.2	22
23	.3	.14334	187	.14774	193	.15214	198	.15653	204	.3	23
24	.4	.14958	249	.15416	257	.15875	265	.16334	272	.4	24
25	.5	.15581	312	.16059	321	.16537	331	.17015	340	.5	25
26	.6	.16204	374	.16701	385	.17198	397	.17695	408	.6	26
27	.7	.16827	436	.17343	450	.17860	463	.18376	476	.7	27
28	.8	.17450	499	.17986	514	.18521	529	.19056	544	.8	28
29	.9	.18074	561	.18628	578	.19182	595	.19737	613	.9	29
30		.18697		.19270		.19843		.20417			30
31		.19320		.19913		.20504		.21091			31
		16.°4	.....	16.°9	.....	17.°4	.....	17.°9			
20		.12541		.12923		.13306		.13688			20
21	.1	.13168	63	.13570	65	.13971	67	.14373	68	.1	21
22	.2	.13795	125	.14216	129	.14636	133	.15057	137	.2	22
23	.3	.14422	188	.14862	194	.15302	200	.15741	205	.3	23
24	.4	.15049	251	.15508	258	.15967	266	.16426	274	.4	24
25	.5	.15676	314	.16154	323	.16632	333	.17110	342	.5	25
26	.6	.16303	376	.16800	388	.17297	399	.17795	411	.6	26
27	.7	.16930	439	.17447	452	.17963	466	.18479	479	.7	27
28	.8	.17557	502	.18093	517	.18628	532	.19163	548	.8	28
29	.9	.18185	564	.18739	582	.19293	599	.19848	616	.9	29
30		.18812		.19385		.19959		.20532			30
31		.19439		.20031		.20624		.21217			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom.		(t.—t.′)=18°.			(t.—t.′)=19°.			Barom.	
Inches.	Decls. Inches.	(t—t′) p. / 87.18 × 30	Parts for Decls. Inches.	(t—t′) p. / 87.18 × 30	Parts for Decls. Inches.	(t—t′) p. / 87.18 × 30	Parts for Decls. Inches.	(t—t′) p. / 87.18 × 30	Parts for Decls. Inches.	Decls. Inches.	Inches.
		18.°0		18.°5		19.°0		19.°5			
20		.13765		.14147		.14529		.14912			20
21	.1	.14453	69	.14854	71	.15256	73	.15657	75	.1	21
22	.2	.15141	138	.15562	141	.15982	145	.16403	149	.2	22
23	.3	.15829	206	.16269	212	.16709	218	.17148	224	.3	23
24	.4	.16517	275	.16976	283	.17435	291	.17894	298	.4	24
25	.5	.17206	344	.17684	354	.18162	363	.18640	373	.5	25
26	.6	.17894	413	.18391	424	.18888	436	.19385	447	.6	26
27	.7	.18582	482	.19098	495	.19615	509	.20131	522	.7	27
28	.8	.19270	551	.19806	566	.20341	581	.20896	596	.8	28
29	.9	.19959	619	.20513	637	.21067	654	.21622	671	.9	29
30		.20647		.21220	707	.21794		.22367			30
31		.21335		.21928		.22520		.23113			31
		18.°1	.....	18.°6	.....	19.°1	.....	19.°6			
20		.13841		.14223		.14606		.14988			20
21	.1	.14533	69	.14935	71	.15336	73	.15737	75	.1	21
22	.2	.15225	138	.15646	142	.16066	146	.16487	150	.2	22
23	.3	.15917	208	.16357	213	.16797	219	.17236	225	.3	23
24	.4	.16609	277	.17068	284	.17527	292	.17986	300	.4	24
25	.5	.17301	346	.17779	356	.18257	365	.18735	375	.5	25
26	.6	.17993	415	.18490	427	.18987	438	.19485	450	.6	26
27	.7	.18685	484	.19202	498	.19718	511	.20234	525	.7	27
28	.8	.19375	554	.19913	569	.20448	584	.20983	600	.8	28
29	.9	.20070	623	.20624	640	.21178	657	.21733	674	.9	29
30		.20762		.21335		.21909		.22482			30
31		.21454		.22046		.22639	.....	.23232			31
		18.°2	.....	18.°7	.....	19.°2		19.°7			
20		.13918		.14300		.14682		.15065			20
21	.1	.14613	70	.15015	72	.15416	73	.15818	75	.1	21
22	.2	.15309	139	.15730	143	.16050	147	.16571	151	.2	22
23	.3	.16005	209	.16445	215	.16885	220	.17324	226	.3	23
24	.4	.16701	278	.17160	286	.17619	294	.18077	301	.4	24
25	.5	.17397	348	.17875	358	.18353	367	.18831	377	.5	25
26	.6	.18093	418	.18590	429	.19087	440	.19584	452	.6	26
27	.7	.18789	487	.19305	501	.19821	514	.20337	527	.7	27
28	.8	.19485	557	.20020	572	.20555	587	.21090	603	.8	28
29	.9	.20180	626	.20735	644	.21289	661	.21844	678	.9	29
30		.20876		.21450		.22023		.22597			30
31		.21572		.22165		.22757		.23350			31
		18.°3	.....	18.°8	.....	19.°3	.....	19.°8			
20		.13994		.14376		.14759		.15141			20
21	.1	.14693	70	.15095	72	.15497	74	.15898	76	.1	21
22	.2	.15393	140	.15814	144	.16235	148	.16655	151	.2	22
23	.3	.16093	210	.16533	216	.16972	221	.17412	227	.3	23
24	.4	.16793	280	.17252	288	.17710	295	.18169	303	.4	24
25	.5	.17492	350	.17970	359	.18448	369	.18926	379	.5	25
26	.6	.18192	420	.18689	431	.19186	443	.19683	454	.6	26
27	.7	.18892	490	.19408	503	.19924	577	.20440	530	.7	27
28	.8	.19592	560	.20127	575	.20662	590	.21197	606	.8	28
39	.9	.20291	630	.20846	647	.21400	664	.21955	681	.9	29
30		.20991		.21564		.22138		.22712			30
31		.21691		.22283		.22876		.23469			31
		18.°4	.....	18.°9	.....	19.°4	.....	19.°9			
20		.14070		.14453		.14835		.15218			20
21	.1	.14774	70	.15175	72	.15577	74	.15978	76	.1	21
22	.2	.15477	141	.15898	145	.16319	148	.16739	152	.2	22
23	.3	.16181	211	.16621	217	.17060	223	.17500	228	.3	23
24	.4	.16885	281	.17343	289	.17802	297	.18261	304	.4	24
25	.5	.17538	352	.18066	361	.18544	371	.19022	380	.5	25
26	.6	.18292	422	.18789	434	.19286	445	.19783	457	.6	26
27	.7	.18995	492	.19511	506	.20027	519	.20544	533	.7	27
28	.8	.19699	563	.20234	577	.20769	593	.21305	609	.8	28
29	.9	.20402	633	.20957	650	.21511	668	.22065	685	.9	29
30		.21106		.21679		.22253		.22826			30
31		.21809		.22402		.22995		.23587			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom. Inches.	Decls. Inches.	(t.—t.′)=20°. (t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	(t.—t.′)=21°. (t—t′) p. 87.18 30	Parts for Decls. Inches.	(t—t′) p. 87.18 30	Parts for Decls. Inches.	Decls. Inches.	Barom. Inches.
		20.°0		20.°5		21.°0		21.°5			
20		.15294		.15676		.16059		.16441			20
21	.1	.16059	76	.16460	78	.16862	80	.17263	82	.1	21
22	.2	.16823	153	.17244	157	.17665	161	.18085	164	.2	22
23	.3	.17588	229	.18028	235	.18467	241	.18907	247	.3	23
24	.4	.18353	306	.18812	314	.19270	321	.19729	329	.4	24
25	.5	.19117	382	.19595	392	.20073	401	.20551	411	.5	25
26	.6	.19882	459	.20379	470	.20876	482	.21373	493	.6	26
27	.7	.20447	535	.21163	549	.21679	562	.22195	575	.7	27
28	.8	.21412	612	.21947	627	.22482	642	.23017	658	.8	28
29	.9	.22176	688	.22731	705	.23285	723	.23840	740	.9	29
30		.22941		.23514		.24088		.24662			30
31		.23707		.24298		.24891		.25484			31
		20.°1	.....	20.°6	.....	21.°1	.....	21.°6			
20		.15370		.15753		.16135		.16517			20
21	.1	.16139	77	.16540	79	.16942	81	.17343	83	.1	21
22	.2	.16907	154	.17328	158	.17749	161	.18169	165	.2	22
23	.3	.17676	231	.18116	236	.18555	242	.18995	248	.3	23
24	.4	.18445	307	.18903	315	.19362	323	.19821	330	.4	24
25	.5	.19213	384	.19691	394	.20169	403	.20646	413	.5	25
26	.6	.19982	461	.20479	473	.20976	484	.21473	496	.6	26
27	.7	.20750	538	.21266	551	.21782	565	.22299	578	.7	27
28	.8	.21519	615	.22054	630	.22589	645	.23125	661	.8	28
29	.9	.22287	692	.22842	709	.23396	726	.23950	743	.9	29
30		.23056		.23629		.24203		.24776			30
31		.23824		.24417		.25010		.25602			31
		20.°2	.....	20.°7	.....	21.°2	.....	21,°7			
20		.15447		.15829		.16212		.16594			20
21	.1	.16219	77	.16621	79	.17022	81	.17424	83	.1	21
22	.2	.16992	154	.17412	158	.17833	162	.18253	166	.2	22
23	.3	.17764	232	.18204	237	.18643	243	.19083	249	.3	23
24	.4	.18536	309	.18995	317	.19454	324	.19913	332	.4	24
25	.5	.19309	386	.19787	396	.20265	405	.20742	415	.5	25
26	.6	.20081	463	.20578	475	.21075	486	.21572	498	.6	26
27	.7	.20853	541	.21370	554	.21886	567	.22402	581	.7	27
28	.8	.21626	618	.22161	633	.22696	648	.23232	664	.8	28
29	.9	.22398	695	.22952	712	.23507	730	.24061	747	.9	29
30		.23170		.23544		.24317		.24891			30
31		.23943		.24535		.25128		.25721			31
		20.°3	.....	20.°8	.....	21.°3	.....	21.°8			
20		.15523		.15906		.16288		.16670			20
21	.1	.16300	78	.16701	80	.17102	81	.17504	83	.1	21
22	.2	.17076	153	.17496	159	.17917	163	.18337	167	.2	22
23	.3	.17852	233	.18292	239	.18731	244	.19171	250	.3	23
24	.4	.18628	310	.19087	318	.19546	326	.20005	333	.4	24
25	.5	.19404	388	.19882	398	.20360	407	.20838	417	.5	25
26	.6	.20180	466	.20677	477	.21175	489	.21672	500	.6	26
27	.7	.20957	543	.21473	557	.21989	570	.22505	583	.7	27
28	.8	.21733	621	.22268	636	.22803	652	.23339	667	.8	28
29	.9	.22509	699	.23063	716	.23618	733	.24172	750	.9	29
30		.23285		.23859		.24432		.25006			30
31		.24061		.24654		.25247		.25839			31
		20.°4	.....	20.°9	.....	21.°4	.....	21.°9			
20		.15600		.15982		.16365		.16747			20
21	.1	.16380	78	.16781	80	.17183	82	.17584	84	.1	21
22	.2	.17160	156	.17580	160	.18001	164	.18422	167	.2	22
23	.3	.17940	234	.18380	240	.18819	245	.19259	251	.3	23
24	.4	.18720	312	.19179	320	.19637	327	.20096	335	.4	24
25	.5	.19500	390	.19978	400	.20456	409	.20934	419	.5	25
26	.6	.20280	468	.20777	479	.21174	491	.21771	502	.6	26
27	.7	.21060	546	.21576	559	.22092	573	.22608	586	.7	27
28	.8	.21840	624	.22375	639	.22910	655	.23446	670	.8	28
29	.9	.22620	702	.23174	718	.23729	736	.24283	754	.9	29
30		.23300		.23973		.24547		.25120			30
31		.24180		.24772		.25365		.25958			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom. Inches.	Decl. Inches.	(t.—t.′)=22°. (t—t′) p. 87.18 30	Parts for Decl. Inches.	(t—t′) p. 87.18 30	Parts for Decl. Inches.	(t—t′)=23°. (t—t′) p. 87.18 30	Parts for Decl. Inches.	(t—t′) p. 87.18 30	Parts for Decl. Inches.	Decl. Inches.	Barom. Inches.
		22.°0		22.°5		23.°0		23.°5			
20		.16823		.17206		.17588		.17970			20
21	.1	.17665	84	.18066	86	.18467	88	.18869	90.	.1	21
22	.2	.18506	168	.18926	172	.19347	176	.19767	180.	.2	22
23	.3	.19347	252	.19787	258	.20226	264	.20666	270.	.3	23
24	.4	.20188	336	.20647	344	.21106	252	.21565	359.	.4	24
25	.5	.21029	421	.21507	430	.21985	440	.22463	449.	.5	25
26	.6	.21870	505	.22367	516	.22865	528	.23362	539.	.6	26
27	.9	.22712	589	.23228	602	.23744	616	.24260	629.	.7	27
28	.7	.23553	673	.24088	688	.24623	704	.25159	719.	.8	28
29	.8	.24394	757	.24948	774	.25503	791	.26057	809.	.9	29
30		.25235		.25809		.26382		.26956			30
31		.26076		.26669		.27262		.27854			31
		22.°1	.....	22.°6	.....	23.°1	.....	23.°6			
20		.16900		.17282		.17665		.18047			20
21	.1	.17745	85	.18146	86	.18548	88	.18949	90	.1	21
22	.2	.18590	170	.19010	173	.19431	177	.19852	180	.2	22
23	.3	.19435	254	.19875	259	.20314	265	.20754	271	.3	23
24	.4	.20280	338	.20739	346	.21197	353	.21656	361	.4	24
25	.5	.21125	423	.21603	432	.22081	442	.22559	451	.5	25
26	.6	.21970	507	.22467	518	.22964	530	.23461	541	.6	26
27	.7	.22815	592	.23331	605	.23847	618	.24363	632	.7	27
28	.8	.23660	675	.24195	691	.24730	707	.25266	722	.8	28
29	.9	.24505	761	.25059	778	.25614	795	.26168	812	.9	29
30		.25350		.25923		.26497		.27070	902		30
31		.26195		.26787		.27380		.27973			31
		22.°2	.....	22.°7	.....	23.°2	.....	23.°7			
20		.16976		.17359		.17741		.18123			20
21	.1	.17825	85	.18227	86	.18628	89	.19030	91	.1	21
22	.2	.18674	170	.19095	174	.19515	177	.19936	181	.2	22
23	.3	.19528	255	.19962	260	.20402	266	.20842	272	.3	23
24	.4	.20372	340	.20830	347	.21289	355	.21748	362	.4	24
25	.5	.21220	424	.21698	434	.22176	444	.22654	453	.5	25
26	.6	.22069	509	.22566	521	.23063	532	.23560	544	.6	26
27	.7	.22918	594	.23434	608	.23950	621	.24467	634	.7	27
28	.8	.23767	678	.24302	694	.24837	710	.25373	725	.8	28
29	.9	.24616	764	.25170	781	.25724	798	.26279	816	.9	29
30		.25465		.26038		.26612		.27185			30
31		.26313		.26906		.27499		.28091			31
		22.°3	.....	22.°8	.....	23.°3	.....	23.°8			
20		.17053		.17435		.17817		.18200			20
21	.1	.17905	85	.18307	87	.18708	89	.19110	91	.1	21
22	.2	.18758	171	.19179	174	.19599	178	.20020	182	.2	22
23	.3	.19611	256	.20050	262	.20490	267	.20930	273	.3	23
24	.4	.20463	341	.20922	349	.21381	256	.21840	364	.4	24
25	.5	.21316	426	.21794	436	.22272	445	.22750	455	.5	25
26	.6	.22169	512	.22666	523	.23163	535	.23660	546	.6	26
27	.7	.23021	597	.23537	610	.24054	624	.24570	637	.7	27
28	.8	.23874	682	.24409	697	.24944	713	.25480	728	.8	28
29	.9	.24727	767	.25281	785	.25835	802	.26390	819	.9	29
30		.25579		.26153		.26726		.27300			30
31		.26432		.27024		.27617		.28210			31
		22.°4	.....	22.°9	.....	22.°4	.....	23.°9			
20		.17129		.17512		.17894		.18276			20
21	.1	.17986	86	.18387	88	.18789	89	.19190	91	.1	21
22	.2	.18842	171	.19263	175	.19683	179	.20104	183	.2	22
23	.3	.19699	257	.20138	263	.20578	268	.21018	274	.3	23
24	.4	.20555	343	.21014	350	.21473	358	.21932	366	.4	24
25	.5	.21412	428	.21890	438	.22367	447	.22845	457	.5	25
26	.6	.22268	514	.22765	525	.23262	537	.23759	548	.6	26
27	.7	.23125	600	.23641	613	.24157	626	.24673	640	.7	27
28	.8	.23981	685	.24516	700	.25052	716	.25587	731	.8	28
29	.9	.24837	771	.25392	788	.25946	805	.26501	822	.9	29
30		.25694		.26267		.26841		.27414			30
31		.26550		.27143		.27736		.28328			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom. Inches.	Decl. Inches.	(t—t′) 24°. (t—t′)p. / 87.18 30	Parts for Decl. Inches.	(t—t′) p. / 87.18 30	Part for Decl. Inches.	(t—t′)=25°. (t—t′) p. / 87.18 30	Parts for Decl. Inches.	(t—t′) p / 87.18 30	Parts for Decl. Inches.	Decl. Inches.	Barom. Inches.
		24.°0		24.°5		25.°0		25.°5			
20		.18353		.18735		.19117		.19500			20
21	.1	.19270	92	.19672	94	.20073	96	.20475	98	.1	21
22	.2	.20188	184	.20609	187	.21029	191	.21450	195	.2	22
23	.3	.21106	275	.21545	281	.21985	287	.22425	293	.3	23
24	.4	.22023	367	.22482	375	.22941	382	.23400	390	.4	24
25	.5	.22941	460	.23420	468	.23897	478	.24375	488	.5	25
26	.6	.23859	551	.24356	562	.24853	574	.25350	585	.6	26
27	.7	.24776	642	.25292	656	.25809	669	.26325	683	.7	27
28	.8	.25694	734	.26229	749	.26764	765	.27300	780	.8	28
29	.9	.26612	826	.27166	843	.27720	860	.28275	878	.9	29
30		.27529		.28103		.28676		.29250			30
31		.28447		.29039		.29632		.30225			31
		24.°1	.....	24.°6	.....	25.°1	.....	25.°6			
20		.18429		.18812		.19194		.19576			20
21	.1	.19351	92	.19752	94	.20154	96	.20555	98	.1	21
22	.2	.20272	184	.20693	188	.21113	192	.21534	196	.2	22
23	.3	.21194	276	.21633	282	.22073	288	.22513	294	.3	23
24	.4	.22115	369	.22574	376	.23033	384	.23492	392	.4	24
25	.5	.23037	461	.23515	470	.24992	490	.24470	489	.5	25
26	.6	.23958	553	.24455	564	.24952	576	.25449	587	.6	26
27	.7	.24879	645	.25396	658	.25912	672	.26428	685	.7	27
28	.8	.25801	737	.26336	753	.26872	768	.27407	783	.8	28
29	.9	.26722	829	.27277	847	.27831	864	.28386	881	.9	29
30		.27644		.28217		28791		.29364			30
31		.28565		.29158		.29751		.30343			31
		24.°2	.....	24.°7	.....	25.°2	.....	25.°7			
20		.18506		.18888		.19270		.19653			20
21	.1	.19431	93	.19832	94	.20234	96	.20635	98	.1	21
22	.2	.20356	185	.20777	189	.21197	193	.21618	197	.2	22
23	.3	.21282	278	.21721	283	.22161	289	.22600	295	.3	23
24	.4	.22207	370	.22666	378	.23124	385	.23583	393	.4	24
25	.5	.23132	463	.23610	472	.24088	482	.24566	491	.5	25
26	.6	.24057	555	.24555	566	.25052	578	.25549	590	.6	26
27	.7	.24983	648	.25499	661	.26015	675	.26529	688	.7	27
28	.8	.25908	740	.26443	756	.26979	771	.27514	786	.8	28
29	.9	.26833	833	.27388	851	.27942	867	.28497	884	.9	29
30		.27759		.28332		.28906		.29479			30
31		.28684		.29277		.29869		.30462			31
		24.°3	.....	24.°8	.....	25.°3	.....	25.°8			
20		.28582		.18965		.19347		.19729			20
21	.1	.29511	93	.19913	95	.20314	97	.20716	99	.1	21
22	.2	.20440	186	.20861	190	.21282	194	.21702	197	.2	22
23	.3	.21370	279	.21809	285	.22249	290	.22689	296	.3	23
24	.4	.22299	372	.22757	379	.23216	387	.23675	395	.4	24
25	.5	.23228	465	.23707	474	.24184	484	.24662	493	.5	25
26	.6	.24157	558	.24654	569	.25151	580	.25648	592	.6	26
27	.7	.25086	650	.25602	664	.26118	677	.26634	691	.7	27
28	.8	.26015	743	.26550	759	.27086	774	.27621	789	.8	28
29	.9	.26944	836	.27499	853	.28053	871	.28607	888	.9	29
30		.27873		.28447		.29020		.29594			30
31		.28802		.29359		.29988		.30580			31
		24.°4	.....	24.°9	.....	25.°4	.....	25.°9			
20		.18659		.19041		.19423		.19806			20
21	.1	.19592	95	.19993	95	.20394	97	.20796	99	.1	21
26	.2	.20524	189	.20945	190	.21366	194	.23179	198	.2	22
23	.3	.21457	284	.21897	286	.22337	291	.22777	297	.3	23
24	.4	.22390	379	.22849	381	.23308	389	.23767	396	.4	24
25	.5	.23323	473	.23801	470	.24279	486	.24757	495	.5	25
26	.6	.24256	568	.24753	571	.25250	583	.25747	594	.6	26
27	.7	.25189	662	.25705	660	.26222	680	.26738	693	.7	27
28	.8	.26122	757	.26657	762	.27193	777	.27728	792	.8	28
29	.9	.27055	852	.27609	857	.28164	874	.28718	891	.9	29
30		.27988		.28562		.29135		.29709			30
31		.28921		.29514		.30106		.30699			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom. Inches.	Decl. Inches.	(t—t′)=26°. (t—t′) p. 87.18 30	Parts for Decl. Inches.	(t—t′) p. 87.18 30	Parts for Decl. Inches.	(t—t′)=27°. (t—t′) p. 87·18 30	Parts for Decl. Inches.	(t—t′) p. 87.18 30	Parts for Decl. Inches.	Decl. Inches.	Barom. Inches.
		26.°0		26.°5		27.°0		27.°5			
20		.19882		.20264		.20647		.21029			20
21	.1	.20876	99	.21278	101	.21679	103	.22081	105	.1	21
22	.2	.21870	199	.22298	203	.22712	207	.23132	210	.2	22
23	.3	.22864	298	.23304	304	.23744	310	.24184	315	.3	23
24	.4	.23859	398	.24317	405	.24776	413	.25235	421	.4	24
25	.5	.24853	497	.25331	507	.25809	516	.26287	526	.5	25
26	.6	.25847	597	.26344	608	.26841	619	.27338	631	.6	26
27	.7	.26841	696	.27357	709	.27873	723	.28389	736	.7	27
28	.8	.27835	795	.28370	811	.28906	826	.29441	841	.8	28
29	.9	.28829	895	.29384	912	.29938	929	.30492	946	.9	29
30		.29823		.30397		.30970		.31545			30
31		.30817		.31400		.32003		.32595			31
		26.°1	.....	26.°6	.....	27.°1	.....	27.°6			
20		.19959		.30341		.20723		.21106			20
21	.1	.20957	100	.21358	102	.21759	104	.22162	106	.1	21
22	.2	.21955	200	.22375	202	.22796	207	.23217	211	.2	22
23	.3	.22952	299	.23392	305	.23832	311	.24272	317	.3	23
24	.4	.23950	399	.24409	407	.24868	415	.25328	422	.4	24
25	.5	.24948	499	25426	509	.25904	518	.26383	528	.5	25
26	.6	.25946	599	.26443	610	.26940	622	.27438	633	.6	26
27	.7	.26944	699	.27460	712	.27977	725	.28494	739	.7	27
28	.8	.27943	798	.28477	814	.29013	829	.29549	844	.8	28
29	.9	.28940	898	.29494	915	.30049	933	.30604	950	.9	29
30		.29938		.30511		.31085		.31660			30
31		.30936		.31529		.32121		.32715			31
		26.°2	.....	26.°7	.....	27.°2	.....	27.°7			
20		.20035		.20417		.20800		.21182			20
21	.1	.21037	100	.21438	102	.21840	104	.22241	106	.1	21
22	.2	.22039	200	.22459	204	.22880	208	.23300	212	.2	22
23	.3	.23041	301	.23480	306	.23920	312	.24359	318	.3	23
24	.4	.24042	401	.24501	408	.24960	416	.25419	424	.4	24
25	.5	.25044	501	.25522	510	.26000	520	.26478	530	.5	25
26	.6	.26046	601	.26543	613	.27040	624	.27537	636	.6	26
27	.7	.27047	701	.27564	715	.28080	728	.28596	741	.7	27
28	.8	.28049	801	.28584	817	.29120	832	29655	847	.8	28
29	.9	.29051	902	.29605	919	.30160	936	.30714	953	.9	29
30		.30053		.30626		.31020		.31773			33
31		.31054		.31647		.32240		.32832			31
		26.°3	.....	26.°8	.....	27.°3	.....	27.°8			
20		.20112		.20494		.20876		.21259			20
21	.1	.21117	101	.21519	103	.21920	104	.22322	106	.1	21
22	.2	.22123	201	.22543	205	.22964	209	.23384	213	.2	22
23	.3	.23128	302	.23568	307	.24008	313	.24447	319	.3	23
24	.4	.24134	402	.24593	410	.25052	418	.25510	425	.4	24
25	.5	.25139	503	.25617	512	.26095	522	.26573	531	.5	25
26	.6	.26145	603	.26646	615	.27139	626	.27636	638	.6	26
27	.7	.27151	704	.27677	717	.28183	731	.28699	744	.7	27
28	.8	.28156	805	.28691	820	.29227	835	.29762	850	.8	28
29	.9	.29162	905	.29717	922	.30271	939	.30825	957	.9	29
30		.30167		.30741		.31314		.31880			30
31		.31173		.31776		.32358		.32951			31
		26.°4	.....	26.°9	.....	27.°4	.....	27.°9			
20		.20188		.20570		.20953		.21335			20
21	.1	.21197	101	.21599	103	.22000	105	.22402	107	·1	21
22	.2	.22207	202	.22627	206	.23048	210	.23469	213	.2	22
23	.3	.23216	303	.23656	309	.24096	314	.24535	320	.3	23
24	.4	.24226	404	.24684	411	.25143	419	.25601	427	.4	24
25	.5	.25235	505	.25713	514	.26191	524	.26669	533	.5	25
26	.6	.26244	606	.26742	617	.27239	629	.27736	640	.6	26
27	.7	.27254	707	.27770	720	.28286	733	.28802	747	.7	27
28	.8	.28263	808	.28799	823	.29334	838	.29869	153	.8	28
29	.9	.29273	909	.29827	926	.30381	943	.30936	960	.9	29
30		.30282		.30856		.31429		.32003			30
31		.31291		·31884		.32477		.33069			31

TABLE I,—*Apjohn's Hygrometric Tables.—(Continued.)*

Barom. Inches.	Decl. Inches.	(t.—t.′)=28°0. (t—t′) p. 87.18 30	Parts for Decl. Inches.	(t.—t.′)=28°5. (t—t′) p. 87.18 30	Parts for Decl. Inches.	(t.—t.′)=29°. (t—t′) p. 87.18 30	Parts for Decl. Inches.	(t.—t.′)=29°5. (t—t′) p. 87.18 30	Parts for Decl. Inches.	Decl. Inches.	Barom. Inches.
		28.°0		28.°5		29.°0		29.°5			
20		.21412		.21794		.22176		.22559			20
21	.1	.22482	107	.22884	109	.23285	111	.23687	113	.1	21
22	.2	.23553	214	.23973	218	.24394	222	.24814	226	.2	22
23	.3	.24623	321	.25063	327	.25503	333	.25942	338	.3	23
24	.4	.25694	428	.26153	436	.26612	444	.27070	451	.4	24
25	.5	.26764	535	.27242	545	.27721	554	.28198	564	.5	25
26	.6	.27835	642	.28332	654	.28829	665	.29326	677	.6	26
27	.7	.28906	749	.29422	763	.29938	776	.30454	790	.7	27
28	.8	.29976	857	.30511	872	.31047	887	.31582	902	.8	28
29	.9	.31047	964	.31600	981	.32156	998	.32710	1015	.9	29
30		.32117		.32691		.33264		.33838			30
31		.33188		.33781		.34373		.34965			31
		28.°1	.....	28.°6	.....	29.°1	.....	29.°6			
20		.21488		.21867		.22253		.22635			20
21	.1	.22562	107	.22961	109	.33365	111	.23767	113	.1	21
22	.2	.23637	215	.24054	219	.24478	223	.24899	226	.2	22
23	.3	.24711	322	.25148	328	.25591	334	.26030	340	.3	23
24	.4	.25786	430	.26242	438	.26703	445	.27162	453	.4	24
25	.5	.26860	537	.27336	547	.27816	556	.28294	566	.5	25
26	.6	.27934	645	.28430	656	.28929	668	.29426	679	.6	26
27	.7	.29009	752	.29524	766	.30041	779	.30559	792	.7	27
28	.8	.30083	860	.30618	875	.31154	890	.31689	905	.8	28
29	.9	.31157	967	.31712	984	.32266	1001	.32821	1019	.9	29
30		.32232		.32806		.33379		.33953			30
31		.33306		.33899		.34492		.35084			31
		28.°2	.....	28.°7	.....	29.°2	.....	29.°7			
20		.21564		.21947		.22329		.22712			20
21	.1	.22643	108	.23044	110	.23446	112	.23847	114	.1	21
22	.2	.23721	216	.24144	220	.24562	223	.24983	227	.2	22
23	.3	.24799	324	.25239	329	.25679	335	.26118	341	.3	23
24	.4	.25877	431	.26336	439	.26795	447	.27254	454	.4	24
25	.5	.26956	539	.27434	549	.27912	558	.28389	568	.5	25
26	.6	.28034	647	.28531	658	.29028	670	.29525	681	.6	26
27	.7	.29112	755	.29628	768	.30144	782	.30661	795	.7	27
28	.8	.30190	863	.30726	879	.31261	893	.31796	909	.8	28
29	.9	.31269	970	.31823	988	.32377	1006	.32932	1022	.9	29
30		.32347		.32920		.33494		.34067			30
31		.33425		.34018		.34610		.35203			31
		28.°3	.....	28.°8	.....	29.°3	.....	29.°8			
20		.21641		.22023		.22406		.22788			20
21	.1	.22723	108	.23124	110	.23526	112	.23927	114	.1	21
22	.2	.23805	216	.24226	220	.24646	224	.25067	228	.2	22
23	.3	.24887	325	.25327	330	.25767	336	.26206	342	.3	23
24	.4	.25969	433	.26428	440	.26887	448	.27346	456	.4	24
25	.5	.27051	541	.27529	551	.28007	560	.28485	570	.5	25
26	.6	.28133	649	.28630	661	.29127	672	.29624	684	.6	26
27	.7	.29215	757	.29731	771	.30248	784	.30764	798	.7	27
28	.8	.30297	866	.30833	881	.31368	896	.31903	912	.8	28
29	.9	.31379	974	.31934	991	.32488	1008	.33043	1026	.9	29
30		.32461		.33035		.33609		.34182			30
31		.33544		.34136		.34729		.35321			31
		28.°4	.....	28.°9	.....	29.°4	.....	29.°9			
20		.21717		.22100		.22482		.22864			20
21	.1	.22803	109	.23205	111	.23606	112	.24008	114	.1	21
22	.2	.23889	217	.24310	221	.24730	225	.25151	229	.2	22
23	.3	.24975	326	.25415	332	.25854	337	.26294	343	.3	23
24	.4	.26061	434	.26520	442	.26979	450	.27437	457	.4	24
25	.5	.27147	543	.27625	553	.28103	562	.28581	572	.5	25
26	.6	.28233	652	.28730	663	.29327	675	.29724	686	.6	26
27	.7	.29319	760	.29835	774	.30351	787	.30867	800	.7	27
28	.8	.30404	869	.30940	884	.31475	899	.32010	915	.8	28
29	.9	.31490	977	.32045	995	.32599	1012	.33154	1029	.9	29
30		.32576		.33150		.33723		.34297			30
31		.33652		.34255		.34857		.35440			31

TABLE II,—*Apjohn's Hygrometric Tables.*

Wet Bulb.	Depression of Bulb below Dry Thermometer in degrees, Fahrenheit.								Wet Bulb.
	1°	2°	3°	4°	5°	6°	7°	8°	
10	4	7	11	14	18	21	25	28	10
11	4	7	11	14	18	22	25	29	11
12	4	7	11	15	19	22	26	30	12
13	4	8	11	15	19	23	27	30	13
14	4	8	12	16	20	24	28	32	14
15	4	8	12	16	21	25	29	33	15
16	4	9	13	17	22	26	30	34	16
17	4	9	13	18	22	26	31	35	17
18	5	9	14	18	23	28	32	37	18
19	5	10	14	19	24	29	34	38	19
20	5	10	15	20	25	29	34	39	20
21	5	10	15	20	26	31	36	41	21
22	5	11	16	21	27	32	37	42	22
23	6	11	17	22	28	33	39	44	23
24	6	11	17	23	29	34	40	46	24
25	6	12	18	24	30	35	41	47	25
26	6	12	19	25	31	37	43	50	26
27	6	13	19	26	32	38	45	51	27
28	7	13	20	26	33	40	46	53	28
29	7	14	21	28	35	41	48	55	29
30	7	14	21	28	36	43	50	57	30
31	7	15	22	30	37	44	52	59	31
32	8	15	23	31	39	46	54	62	32
33	8	16	24	32	41	49	57	65	33
34	8	17	25	33	42	50	58	66	34
35	9	17	26	34	43	51	60	68	35
36	9	18	26	35	44	53	62	70	36
37	9	18	27	36	46	55	64	73	37
38	9	19	28	38	47	56	66	75	38
39	10	20	29	39	49	59	69	78	39
40	10	20	30	40	51	61	71	81	40
41	11	21	32	42	53	63	74	84	41
42	11	22	32	43	54	65	76	86	42
43	11	22	34	45	56	67	78	90	43
44	12	23	35	46	58	70	81	93	44
45	12	24	36	48	60	72	84	96	45
46	12	25	37	50	62	74	87	99	46
47	13	26	39	52	65	77	90	103	47
48	13	27	40	53	67	80	93	106	48
49	14	28	41	55	69	83	97	110	49
50	14	29	43	57	72	86	100	114	50
51	15	29	44	59	74	88	103	118	51
52	15	31	46	61	77	92	107	122	52
53	16	32	47	63	79	95	111	126	53
54	16	33	49	66	82	98	115	131	54
55	17	34	51	68	85	101	118	135	55
56	17	35	53	70	88	105	123	140	56
57	18	36	54	72	91	109	127	145	57
58	19	37	56	75	94	112	131	150	58
59	19	39	58	77	97	116	135	154	59
60	20	40	60	80	100	120	140	160	60
61	21	42	62	83	104	125	146	166	61
62	21	43	64	86	107	128	150	171	62
63	22	44	66	88	111	133	155	177	63
64	23	46	68	91	114	137	160	182	64
65	24	48	71	95	119	143	167	190	65
66	24	49	73	98	122	146	171	195	66
67	25	50	76	101	126	151	177	202	67
68	26	52	78	104	130	156	182	208	68
69	27	54	81	108	135	161	188	215	69
70	28	56	82	111	139	167	195	222	70

TABLE II,—*Apjohn's Hygrometric Tables.—(Continued.)*

Wet Bulb.	Depression of Wet Bulb below Dry Thermometer, in degrees Fahrenheit.								Wet Bulb.
	9°	10°	11°	12°	13°	14°	15°	16°	
10	32	35	39	42	46	49	53	56	10
11	32	36	40	43	47	50	54	58	11
12	33	37	41	44	48	52	56	59	12
13	34	38	42	46	49	53	57	61	13
14	36	40	44	48	52	56	60	64	14
15	37	41	45	49	53	57	62	66	15
16	39	43	47	52	56	60	65	69	16
17	40	44	48	53	57	62	66	70	17
18	41	46	51	55	60	64	69	74	18
19	43	48	53	58	62	67	72	77	19
20	44	49	54	59	64	69	74	78	20
21	46	51	56	61	66	71	77	82	21
22	48	53	58	64	69	74	80	85	22
23	50	55	61	66	72	77	83	88	23
24	51	57	63	68	74	80	86	91	24
25	53	59	65	71	77	83	89	94	25
26	56	62	68	74	81	87	93	99	26
27	58	64	71	77	83	90	96	102	27
28	59	66	73	79	86	92	99	106	28
29	62	69	76	83	90	97	104	110	29
30	64	71	78	85	92	99	107	114	30
31	67	74	81	89	96	104	111	118	31
32	69	77	85	92	100	108	116	123	32
33	73	81	89	97	105	113	122	130	33
34	75	83	91	100	108	116	125	133	34
35	77	85	94	102	111	119	128	136	35
36	79	88	97	106	114	123	132	141	36
37	82	91	100	109	118	127	137	146	37
38	85	94	103	113	122	132	141	150	38
39	88	98	108	118	127	137	147	157	39
40	91	101	111	121	131	141	152	162	40
41	95	105	116	126	137	147	158	168	41
42	97	108	119	130	140	151	162	173	42
43	101	112	123	134	146	157	168	179	43
44	104	116	128	139	151	162	174	186	44
45	108	120	132	144	156	168	180	192	45
46	112	124	136	149	161	174	186	198	46
47	116	129	142	155	168	181	194	206	47
48	120	133	146	160	173	186	200	213	48
49	124	138	152	166	179	193	207	221	49
50	129	143	157	172	186	200	215	229	50
51	132	147	162	176	191	206	221	235	51
52	138	153	168	184	199	214	230	245	52
53	142	158	174	190	205	221	237	253	53
54	148	164	180	197	213	230	246	262	54
55	152	169	186	203	220	237	254	270	55
56	158	175	193	210	228	245	263	280	56
57	163	181	199	217	235	253	272	290	57
58	168	187	206	224	243	262	281	299	58
59	174	193	212	232	251	270	290	309	59
60	180	200	220	240	260	280	300	320	60
61	187	208	229	250	270	291	312	333	61
62	193	214	235	257	278	300	321	342	52
63	199	221	243	265	287	309	332	354	63
64	205	228	251	274	296	319	342	365	64
65	214	238	262	286	309	333	357	381	65
66	220	244	268	293	317	342	366	390	66
67	227	252	277	302	328	353	378	403	67
68	234	260	286	312	338	364	390	416	68
69	242	269	296	323	350	377	404	430	69
70	250	278	306	334	361	389	417	445	70

TABLE II,—*Apjohn's Hygrometric Tables.—(Continued.)*

Wet Bulb.	Depression of Wet Bulb below Dry Thermometer, in degrees Fahrenheit.								Wet Bulb.
	17°	18°	19°	20°	21°	22°	23°	24°	
10	60	63	67	70	74	77	81	84	10
11	61	65	68	72	76	79	83	86	11
12	63	67	70	74	78	81	85	89	12
13	65	68	72	76	80	84	87	91	13
14	68	72	76	80	84	88	92	96	14
15	70	74	78	82	86	90	94	98	15
16	73	77	82	86	90	95	99	103	16
17	75	79	84	88	92	97	101	106	17
18	78	83	87	92	97	101	106	110	18
19	82	86	91	96	101	106	110	115	19
20	83	88	93	98	103	108	113	118	20
21	87	92	97	102	107	112	117	122	21
22	90	95	101	106	111	117	122	127	22
23	94	99	105	110	116	121	127	132	23
24	97	103	108	114	120	125	131	137	24
25	100	106	112	118	124	130	136	142	25
26	105	112	118	124	130	136	143	149	26
27	109	115	122	128	134	141	147	154	27
28	112	119	125	132	139	145	152	158	28
29	117	124	131	138	145	152	159	166	29
30	121	128	135	142	149	156	163	170	30
31	126	133	141	148	155	163	170	178	31
32	131	139	146	154	162	169	177	185	32
33	138	146	154	162	170	178	186	194	33
34	141	149	158	166	174	183	191	199	34
35	145	153	162	170	179	187	196	204	35
36	150	158	167	176	185	194	202	211	36
37	155	164	173	182	191	200	209	218	37
38	160	169	179	188	197	207	216	226	38
39	166	176	186	196	206	216	225	235	39
40	172	182	192	202	212	222	232	242	40
41	179	189	200	210	221	231	242	252	41
42	184	194	205	216	227	238	248	259	42
43	190	202	213	224	235	246	258	269	43
44	197	209	220	232	244	255	267	278	44
45	204	216	228	240	252	264	276	288	45
46	211	223	236	248	260	272	285	298	46
47	219	232	245	258	271	284	297	310	47
48	226	239	253	266	279	293	306	319	48
49	235	248	262	276	290	304	317	331	49
50	243	257	272	286	300	315	329	343	50
51	250	265	279	294	309	323	338	353	51
52	260	275	291	306	321	337	352	367	52
53	269	284	300	316	332	348	363	379	53
54	279	295	312	328	344	361	377	394	54
55	287	304	321	338	355	372	389	406	55
56	298	315	333	350	368	385	403	420	56
57	308	326	344	362	380	398	416	434	57
58	318	337	355	374	393	411	430	449	58
59	328	347	367	386	405	425	444	463	59
60	340	360	380	400	420	440	460	480	60
61	354	374	395	416	437	458	478	499	61
62	364	385	407	428	449	471	492	514	62
63	376	398	420	442	464	486	508	530	63
64	388	410	433	456	479	502	524	547	64
65	402	428	452	476	500	524	547	571	65
66	415	439	464	488	512	537	561	586	66
67	428	454	479	504	529	554	580	605	67
68	442	468	494	520	546	572	598	624	68
69	457	484	511	538	565	592	619	646	69
70	473	500	528	556	584	611	639	667	70

TABLE II,—*Apjohn's Hygrometric Tables.—(Continued.)*

Wet Bulb.	Depression of Wet Bulb below Dry Thermometer, in degrees Fahrenheit.								Wet Bulb.
	25°	26°	27°	28°	29°	30°	00	00	
10	88	91	95	98	102	105	....	....	10
11	90	94	97	101	104	108	....	....	11
12	93	96	100	104	107	111	....	....	12
13	95	99	103	106	110	114	....	....	13
14	100	104	108	112	116	120	....	....	14
15	103	107	111	115	119	123	....	....	15
16	108	113	116	120	125	129	...	....	16
17	110	114	119	123	128	132	...	....	17
18	115	120	124	129	133	138	....	....	18
19	120	125	129	134	139	144	....	....	19
20	123	127	132	137	142	147	....	....	20
21	128	133	138	143	148	153	....	....	21
22	133	138	143	148	154	159	....	....	22
23	138	143	149	154	160	165	....	....	23
24	143	148	154	160	165	171	....	....	24
25	148	153	159	165	171	177	....	....	25
26	155	161	167	174	180	186	....	....	26
27	160	166	173	179	186	192	....	....	27
28	165	172	178	185	191	198	....	....	28
29	173	179	186	193	200	205	....	....	29
30	178	185	192	199	206	213	....	....	30
31	185	192	200	207	215	222	....	....	31
32	193	200	208	216	223	231	....	....	32
33	203	211	219	227	234	243	....	....	33
34	208	216	224	232	241	249	....	....	34
35	213	221	230	238	247	255	....	....	35
36	220	229	238	246	255	264	....	....	36
37	228	231	246	255	264	273	....	....	37
38	235	244	254	263	273	282	.. .	....	38
39	245	255	265	274	284	294	....	....	39
40	253	263	273	283	293	303	....	....	40
41	263	273	284	294	305	315	....	....	41
42	270	281	292	302	313	324	....	....	42
43	280	292	302	314	325	336	....	....	43
44	290	302	313	325	336	348	....	....	44
45	300	312	324	336	348	360	....	....	45
46	310	322	335	347	355	372	....	....	46
47	323	335	348	361	374	387	....	....	47
48	333	346	359	372	386	399	....	....	48
49	345	359	373	386	400	414	....	....	49
50	358	372	386	400	415	429	....	....	50
51	368	382	397	412	426	441	....	....	51
52	383	398	413	428	444	459	....	....	52
53	395	411	427	442	458	474	....	....	53
54	410	426	443	459	476	492	....	....	54
55	423	439	456	473	490	507	....	....	55
56	438	455	473	490	508	525	....	....	56
57	453	471	489	507	525	543	....	....	57
58	468	486	505	524	542	561	....	....	58
59	483	502	521	540	560	579	....	....	59
60	500	520	540	560	580	600	....	....	60
61	520	541	562	582	603	624	....	....	61
62	535	556	578	599	621	642	....	....	62
63	553	575	597	619	641	663	....	....	63
64	570	593	616	638	661	684	....	....	64
65	595	619	643	666	690	714	....	....	65
66	610	634	659	683	708	732	....	....	66
67	631	657	683	710	736	762	....	....	67
68	650	676	702	728	754	780	....	....	68
69	672	699	726	753	780	807	....	....	69
70									70

TABLE II,—*Apjohn's Hygrometric Tables.—(Continued.)*

Wet Bulb.	Depression of Wet Bulb below Dry Thermometer, in degrees Fahrenheit.								Wet Bulb
	1°	2°	3°	4°	5°	6°	7°	8°	
70	28	56	83	111	139	167	195	222	70
71	29	57	86	115	144	172	201	230	71
72	30	59	89	118	148	178	207	237	72
73	31	61	92	123	154	184	215	246	73
74	32	63	95	127	159	190	222	254	74
75	33	65	98	131	164	196	229	262	75
76	34	67	101	135	169	200	236	270	76
77	35	69	104	139	174	208	243	278	77
78	36	72	108	144	180	214	251	287	78
79	37	74	111	148	186	223	260	297	79
80	38	77	115	153	192	230	268	306	80
81	40	79	119	158	198	237	277	316	81
82	41	81	122	162	203	244	284	325	82
83	42	84	126	168	211	253	295	337	83
84	43	87	130	174	217	260	304	347	84
85	45	90	134	179	224	269	314	358	85
86	46	92	139	185	231	277	323	370	86
87	48	95	143	191	239	286	334	382	87
88	49	98	148	197	246	295	344	394	88
89	51	101	152	203	254	304	355	406	89
90	52	105	157	209	262	314	366	418	90
91	54	108	162	216	270	323	377	431	91
92	56	111	167	222	278	334	391	446	92
93	57	115	172	229	287	344	401	458	93
94	59	118	177	236	296	356	414	473	94
95	61	122	183	244	305	365	426	487	95
96	63	126	188	251	314	377	440	502	96
97	65	129	194	259	324	388	453	518	97
98	67	133	200	267	334	400	467	536	98
99	69	137	206	275	344	412	481	550	99
100	71	142	212	283	254	425	496	566	100
101	73	146	219	292	365	438	511	584	101
102	75	150	226	301	375	451	526	602	102
103	77	154	232	310	387	466	542	619	103
104	80	160	239	319	399	479	559	638	104
105	82	164	246	328	411	493	575	657	105
106	85	169	254	338	423	508	592	677	106
107	87	174	260	347	434	521	608	694	107
108	90	179	269	359	449	538	628	718	108
109	92	185	277	370	462	554	647	739	109
110	95	190	285	380	476	571	666	761	110
111	98	196	293	391	490	587	684	780	111
112	101	201	301	403	504	604	705	806	112
113	104	207	311	415	519	622	726	830	113
114	107	213	320	427	534	640	747	854	114
115	110	220	329	439	549	659	769	878	115
116	113	226	339	452	565	678	791	904	116
117	116	232	349	465	581	697	813	930	117
118	120	239	359	478	598	718	837	957	118
119	123	247	370	494	617	740	864	987	119
120	127	253	379	506	633	759	896	1012	120
121	130	260	390	520	651	781	911	1041	121
122	134	268	401	535	669	803	937	1071	122
123	138	275	413	550	688	826	963	1101	123
124	142	283	425	566	708	849	981	1122	124
125	146	291	437	582	728	873	1018	1164	125
126	150	299	449	598	748	898	1047	1197	126
127	154	307	461	615	769	922	1076	1230	127
128	158	316	474	632	790	947	1105	1263	128
129	162	325	487	650	812	974	1137	1299	129
130	167	334	501	668	835	1001	1168	1335	130

TABLE II,—*Apjohn's Hygrometric Tables.—(Continued.)*

Wet Bulb.	Depression of Wet Bulb below Dry Thermometer, in degrees Fahrenheit.								Wet Bulb.
	9°	10°	11°	12°	13°	14°	15°	16°	
70	250	278	306	334	361	389	417	445	70
71	258	287	316	344	373	402	431	459	71
72	266	296	326	355	385	414	444	474	72
73	276	307	338	368	399	430	461	491	73
74	285	317	349	380	412	444	476	507	74
75	294	327	360	392	425	458	491	523	75
76	303	337	371	404	438	472	506	539	76
77	312	347	382	416	451	486	521	555	77
78	323	359	395	431	467	503	539	574	78
79	334	371	408	445	482	519	557	594	79
80	345	383	421	460	498	536	575	613	80
81	356	395	435	474	514	553	593	632	81
82	365	406	447	487	528	568	609	650	82
83	379	411	463	505	547	589	632	674	83
84	391	434	477	521	564	608	651	694	84
85	403	448	493	538	582	627	672	717	85
86	416	462	508	554	601	647	693	739	86
87	429	477	525	572	620	668	716	763	87
88	443	492	541	590	640	689	738	787	88
89	456	507	558	608	659	710	761	811	89
90	461	523	575	628	680	732	785	837	90
91	475	539	593	647	701	755	809	862	91
92	508	557	612	667	723	778	834	890	92
93	516	573	630	688	745	802	860	917	93
94	532	591	650	709	768	827	887	946	94
95	548	609	670	731	792	853	914	974	95
96	565	628	691	754	816	879	942	1004	96
97	582	647	712	776	841	906	971	1035	97
98	600	667	734	800	867	934	1001	1067	98
99	618	687	756	824	893	962	1031	1099	99
100	637	708	779	850	920	991	1062	1133	100
101	657	730	803	876	949	1022	1095	1168	101
102	677	752	827	902	978	1053	1128	1203	102
103	697	774	851	929	1006	1084	1161	1238	103
104	718	798	878	958	1037	1117	1197	1277	104
105	739	821	903	985	1067	1149	1232	1314	105
106	761	846	931	1015	1100	1184	1269	1354	106
107	781	868	955	1042	1128	1215	1302	1389	107
108	807	897	987	1076	1166	1256	1346	1435	108
109	832	924	1016	1109	1201	1294	1386	1478	109
110	856	951	1046	1141	1236	1331	1427	1522	110
111	880	978	1076	1174	1271	1369	1467	1565	111
112	906	1007	1108	1208	1309	1410	1511	1611	112
113	933	1037	1141	1244	1348	1452	1556	1659	113
114	960	1067	1174	1280	1387	1494	1601	1707	114
115	988	1098	1208	1318	1427	1537	1647	1757	115
116	1017	1130	1243	1356	1469	1582	1695	1808	116
117	1046	1162	1278	1394	1511	1627	1743	1859	117
118	1076	1196	1316	1435	1555	1674	1794	1914	118
119	1111	1234	1357	1481	1604	1728	1851	1974	119
120	1139	1265	1392	1518	1645	1771	1898	2024	120
121	1171	1301	1431	1561	1691	1821	1952	2082	121
122	1204	1338	1472	1606	1739	1873	2007	2141	122
123	1238	1376	1514	1651	1789	1926	2064	2202	123
124	1264	1415	1537	1698	1840	1981	2123	2264	124
125	1310	1455	1601	1746	1892	2037	2183	2328	125
126	1346	1496	1646	1795	1945	2094	2244	2394	126
127	1383	1537	1691	1844	1998	2152	2306	2459	127
128	1421	1579	1737	1895	2053	2211	2269	2526	128
129	1462	1624	1786	1949	2111	2274	2436	2598	129
130	1502	1699	1836	2003	2170	2337	2504	2670	130

TABLE II,—*Apjohn's Hygrometric Tables.—(Continued.)*

Wet Bulb.	Depression of Wet Bulb below Dry Thermometer, in degrees Fahrenheit.								Wet Bulb.
	17°	18°	19°	20°	21°	22°	23°	24°	
70	473	500	528	556	584	612	639	667	70
71	488	517	545	574	603	631	660	689	71
72	503	533	562	592	622	651	681	710	72
73	522	553	583	614	645	675	706	737	73
74	539	571	602	634	666	697	729	761	74
75	556	589	621	654	687	719	752	785	75
76	573	607	640	674	708	741	775	809	76
77	590	625	659	694	729	763	798	833	77
78	610	646	682	718	754	790	826	862	78
79	631	668	705	742	779	816	853	890	79
80	651	689	728	766	804	843	881	919	80
81	672	711	751	790	830	869	909	948	81
82	690	731	771	812	853	893	934	974	82
83	716	758	800	842	884	926	968	1010	83
84	738	781	825	868	911	955	998	1042	84
85	762	806	851	896	941	986	1050	1075	85
86	785	832	878	924	970	1016	1063	1109	86
87	811	859	906	954	1002	1049	1097	1145	87
88	836	886	935	984	1033	1082	1132	1181	88
89	862	913	963	1014	1065	1115	1166	1217	89
90	889	941	994	1046	1098	1151	1203	1255	90
91	916	970	1024	1078	1132	1186	1240	1294	91
92	945	1001	1056	1112	1168	1223	1279	1334	92
93	974	1031	1089	1146	1203	1261	1318	1375	93
94	1005	1064	1123	1182	1241	1300	1359	1418	94
95	1035	1096	1157	1218	1279	1340	1401	1462	95
96	1068	1130	1193	1256	1319	1382	1444	1507	96
97	1100	1165	1229	1294	1359	1423	1488	1553	97
98	1134	1201	1267	1334	1401	1467	1534	1601	98
99	1168	1237	1305	1374	1443	1511	1580	1649	99
100	1204	1274	1345	1416	1487	1558	1628	1699	100
101	1241	1314	1389	1460	1533	1606	1679	1752	101
102	1278	1354	1429	1504	1579	1654	1730	1805	102
103	1316	1393	1471	1548	1625	1703	1780	1858	103
104	1357	1436	1516	1596	1676	1756	1835	1915	104
105	1396	1478	1560	1642	1724	1806	1888	1970	105
106	1438	1523	1607	1692	1777	1861	1946	2030	106
107	1476	1562	1649	1736	1823	1910	1996	2083	107
108	1525	1614	1704	1794	1884	1973	2063	2153	108
109	1571	1663	1756	1848	1940	2033	2125	2218	109
110	1617	1712	1807	1902	1997	2092	2187	2282	110
111	1663	1760	1858	1956	2054	2152	2249	2347	111
112	1712	1813	1913	2014	2115	2215	2316	2417	112
113	1763	1867	1970	2074	2178	2281	2385	2489	113
114	1814	1921	2027	2134	2241	2347	2454	2561	114
115	1867	1976	2086	2196	2306	2416	2525	2635	115
116	1921	2034	2147	2260	2373	2486	2599	2712	116
117	1975	2092	2208	2324	2440	2556	2673	2789	117
118	2033	2153	2272	2392	2512	2631	2751	2870	118
119	2098	2221	2345	2468	2591	2715	2838	2962	119
120	2151	2277	2404	2530	2657	2783	2910	3036	120
121	2212	2342	2472	2602	2732	2862	2992	3122	121
122	2275	2408	2542	2676	2810	2944	3077	3211	122
123	2339	2477	2614	2752	2890	3027	3165	3302	123
124	2406	2547	2689	2830	2972	3113	3255	3396	124
125	2474	2619	2765	2910	3056	3201	3346	3492	125
126	2543	2693	2842	2992	3142	3291	3440	3590	126
127	2613	2767	2920	3074	3228	3381	3535	3689	127
128	2684	2842	3000	3158	3316	3474	3632	3790	128
129	2761	2923	3086	3248	3410	3573	3735	3898	129
130	2837	3004	3171	3338	3505	3672	3839	4006	130

TABLE II,—*Apjohn's Hygrometric Tables.—(Continued.)*

Wet Bulb.	Depression of Wet Bulb below Dry Thermometer, in degrees Fahrenheit.								Wet Bulb.
	25°	26°	27°	28°	29°	30°	00	00	00
70	695	723	751	778	806	834			
71	718	746	775	804	832	861			
72	740	770	799	829	858	888			
73	768	798	829	860	890	921			
74	793	824	856	888	919	951			
75	818	850	883	916	948	981			
76	843	876	910	944	977	1011			
77	868	902	937	972	1006	1041			
78	898	933	969	1005	1041	1077			
79	928	965	1002	1039	1076	1113			
80	958	996	1034	1072	1111	1149			
81	988	1027	1067	1106	1146	1185			
82	1015	1056	1096	1137	1177	1218			
83	1053	1095	1137	1179	1221	1263			
84	1085	1128	1172	1215	1259	1302			
85	1120	1165	1210	1254	1299	1344			
86	1155	1201	1247	1294	1340	1386			
87	1193	1240	1288	1336	1383	1431			
88	1230	1279	1328	1378	1427	1476			
89	1268	1318	1369	1420	1470	1521			
90	1308	1360	1412	1464	1517	1569			
91	1348	1401	1455	1509	1563	1617			
92	1390	1446	1501	1557	1612	1668			
93	1433	1490	1547	1604	1662	1719			
94	1478	1537	1596	1655	1714	1773			
95	1523	1583	1644	1705	1766	1827			
96	1570	1633	1696	1758	1821	1884			
97	1618	1682	1747	1812	1876	1941			
98	1668	1734	1801	1868	1934	2001			
99	1718	1786	1855	1924	1992	2061			
100	1770	1841	1912	1982	2053	2124			
101	1825	1898	1971	2044	2117	2190			
102	1880	1955	2030	2106	2181	2256			
103	1935	2012	2090	2167	2245	2322			
104	1995	2075	2155	2234	2314	2394			
105	2053	2135	2217	2299	2381	2463			
106	2115	2200	2234	2369	2453	2538			
107	2170	2257	2344	2430	2517	2604			
108	2243	2332	2422	2512	2601	2691			
109	2310	2402	2495	2587	2680	2772			
110	2378	2473	2568	2663	2758	2853			
111	2445	2543	2641	2738	2836	2934			
112	2518	2618	2719	2820	2920	3021			
113	2593	2696	2800	2904	3007	3111			
114	2668	2774	2881	2988	3094	3201			
115	2745	2855	2965	3074	3184	3294			
116	2825	2938	3051	3164	3277	3390			
117	2905	3021	3137	3254	3370	3486			
118	2990	3110	3229	3349	3468	3588			
119	3085	3208	3332	3455	3579	3702			
120	3163	3289	3416	3542	3669	3795			
121	3253	3383	3513	3643	3773	3903			
122	3345	3479	3613	3746	3880	4014			
123	3440	3578	3715	3853	3990	4128			
124	3538	3679	3821	3962	4104	4245			
125	3638	3783	3929	4074	4220	4365			
126	3740	3890	4039	4189	4338	4488			
127	3843	3996	4150	4304	4457	4611			
128	3948	4105	4263	4421	4579	4737			
129	4060	4222	4385	4547	4710	4872			
130									

Table III,—*Apjohn's Hygrometric Tables.*

Degrees of Fahrenheit's Thermometer, and Tension of Vapour in Inches of Mercury.

Ther.	Tension.	Ther.	Tension.	Ther.	Tension.	Ther.	Tension	Ther.	Tension.
°	In. decls.	°	In. decls.	°	In. decls.	°	In. decls.	°	In. decls.
04.0	0.05246	02.0	0.06598	08.0	0.08277	14.0	0.10354	20.0	0 12915
03.9	0.05266	1	0.06623	1	0.08308	1	0.10393	1	0.12962
8	0.05286	2	0.06648	2	0.08340	2	0.10431	2	0.13010
7	0.05307	3	0.06674	3	0.08371	3	0.10470	3	0.13057
6	0.05326	4	0.06699	4	0.08402	4	0.10599	4	0.13105
5	0.05346	5	0.06725	5	0.08434	5	0.10548	5	0.13153
4	0.05367	6	0.06750	6	0.08466	6	0.10587	6	0.13201
3	0.05388	7	0.06776	7	0.08498	7	0.10626	7	0.13249
2	0.05408	8	0.06802	8	0.08529	8	0.10665	8	0.13298
1	0.05429	02.9	0.06828	08.9	0.08561	14.9	0.10705	20·9	0.13347
03.0	0.05450	03.0	0.06853	09.0	0.08594	15.0	0.10745	21.0	0·13395
02.9	0.05471	1	0.06880	1	0.08626	1	0.10784	1	0.13444
8	0.05492	2	0.06906	2	0.08658	2	0.10824	2	0.13494
7	0.05513	3	0.06932	3	0.08691	3	0.10864	3	0.13543
6	0.05535	4	0.06958	4	0.08723	4	0.10905	4	0.13592
5	0.05556	5	0.06985	5	0.08756	5	0 10945	5	0.13642
4	0.05577	6	0.07011	6	0.08789	6	0.10986	6	0.13692
3	0.05599	7	0.07038	7	0.08822	7	0.11026	7	0.13742
2	0.05620	8	0.07065	8	0.08855	8	0.11067	8	0.13792
1	0.05642	03.9	0.07091	09.9	0.08888	15.9	0.11108	21.9	0.13843
02.0	0 05663	04.0	0.07118	10.0	0.08921	16.0	0.11149	22.0	0.13893
01.9	0.05685	1	0.07145	1	0.08955	1	0.11190	1	0.13944
8	0.05707	2	0.07172	2	0.08988	2	0.11232	2	0.13995
7	0.05729	3	0.07200	3	0.09022	3	0.11273	3	0.14046
6	0.05751	4	0.07227	4	0.09056	4	0.11315	4	0.14097
5	0.05773	5	0.07254	5	0.09090	5	0.11357	5	0.14148
4	0.05795	6	0.07282	6	0.09124	6	0.11399	6	0.14200
3	0.05818	7	0.07309	7	0.09158	7	0.11441	7	0.14252
2	0.05840	8	0.07337	8	0.09192	8	0.11483	8	0.14304
1	0.05862	04.9	0.07365	10.9	0.09226	16.9	0.11525	22.9	0.14356
01.0	0.05885	05.0	0.07393	11.0	0.09261	17.0	0.11568	23.0	0.14408
00.9	0.05907	1	0.07421	1	0.09296	1	0.11610	1	0.14460
8	0.05930	2	0.07449	2	0.09330	2	0.11653	2	0.14513
7	0.05952	3	0.07477	3	0.09365	3	0.11696	3	0.14566
6	0.05975	4	0.07505	4	0.09400	4	0.11739	4	0.14619
5	0.05998	5	0.07533	5	0.09435	5	0.11783	5	0.14672
4	0.06021	6	0.07562	6	0.09470	6	0.11826	6	0.14725
3	0.06044	7	0.07590	7	0.09506	7	0.11870	7	0.14779
2	0.06067	8	0.07619	8	0.09541	8	0.11913	8	0.14833
1	0.06091	05.9	0.07648	11.9	0.09577	17.9	0.11957	23.9	0.14887
00.0	0.06114	06.0	0.07677	12.0	0.09612	18.0	0.12001	24.0	0.14941
+.1	0.06137	1	0.07706	1	0.09648	1	0.12046	1	0.14995
2	0.06161	2	0.07735	2	0.09684	2	0.12090	2	0.15050
3	0.06184	3	0.07764	3	0.09721	3	0.12135	3	0.15105
4	0.06208	4	0.07794	4	0.09757	4	0.12179	4	0.15160
5	0.06232	5	0.07823	5	0.09793	5	0.12224	5	0.15215
6	0.06255	6	0 07853	6	0.09830	6	0.12269	6	0.15269
7	0.06279	7	0.07882	7	0.09866	7	0.12314	7	0.15324
8	0.06303	8	0.07912	8	0.09903	8	0.12359	8	0.15380
00.9	0.06327	06.9	0.07942	12.9	0.09940	18.9	0 12405	24.9	0.15436
0.10	0.06352	07.0	0 07972	13.0	0.09977	19.0	0.12450	25 0	0.15492
1	0.06376	1	0.08002	1	0.10014	1	0.12496	1	0.15548
2	0.06400	2	0.08032	2	0.10051	2	0·12542	2	0.15604
3	0.06425	3	0.08062	3	0.10089	3	0.12588	3	0.15661
4	0.06449	4	0.08093	4	0.10126	4	0.12634	4	0.15718
5	0.06474	5	0.08123	5	0.10164	5	0.12680	5	0.15775
6	0.06498	6	0.08154	6	0·10202	6	0.12727	6	0.15832
7	0.06523	7	0.08185	7	0.10240	7	0.12774	7	0.15889
8	0.06548	8	0.08215	8	0.10277	8	0.12820	8	0.15947
01.9	0.06573	07.9	0.08246	13.9	0.10316	19.9	0.12867	25.9	0.16004

TABLE III,—*Apjohn's Hygrometric Tables.—(Continued.)*

Degrees of Farenheit's Thermometer, and Tension of Vapour in Inches of Mercury.

Ther.	Tension.	Ther.	Tension.	Ther.	Tension.	Ther.	Tens	Ther.	Tension.
°		°		°		°		°	
26 0	0 16062	32 0	0 19918	38 0	0 24628	44 0	0 30362	50 0	0 37320
1	0 16120	1	0 19989	1	0 24715	1	0 30467	1	0 37447
2	0 16178	2	0 20061	2	0 24802	2	0 30573	2	0 37576
3	0 16237	3	0 20132	3	0 24889	3	0 30679	3	0 37704
4	0 16296	4	0 20204	4	0 24978	4	0 30785	4	0 37833
5	0 16355	5	0 20276	5	0 25064	5	0 30892	5	0 37962
6	0 16414	6	0 20348	6	0 25152	6	0 30999	6	0 38092
7	0 16473	7	0 20421	7	0 25241	7	0 31107	7	0 38222
8	0 16532	8	0 20494	8	0 25329	8	0 31214	8	0 38352
26 9	0 16592	32 9	0 20567	38 9	0 25418	44 9	0 31322	50 9	0 38483
27 0	0 16652	33 0	0 20640	39 0	0 25508	45 0	0 31431	51 0	0 38614
1	0 16712	1	0 20713	1	0 25597	1	0 31540	1	0 38746
2	0 16772	2	0 20787	2	0 25687	2	0 31649	2	0 38878
3	0 16833	3	0 20861	3	0 25777	3	0 31758	3	0 39011
4	0 16894	4	0 20935	4	0 25868	4	0 31868	4	0 39144
5	0 16954	5	0 21010	5	0 25958	5	0 31978	5	0 39277
6	0 17016	6	0 21084	6	0 26049	6	0 32089	6	0 39411
7	0 17077	7	0 21159	7	0 26141	7	0 32200	7	0 39545
8	0 17138	8	0 21234	8	0 26232	8	0 32311	8	0 39680
27 9	0 17200	33 9	0 21310	39 9	0 26324	45 9	0 32423	51 9	0 39815
28 0	0 17262	34 0	0 21386	40 0	0 26416	46 0	0 32534	52 0	0 39951
1	0 17324	1	0 21462	1	0 26509	1	0 32647	1	0 40087
2	0 17387	2	0 21538	2	0 26602	2	0 32760	2	0 40223
3	0 17449	3	0 21614	3	0 26695	3	0 32873	3	0 40360
4	0 17512	4	0 21691	4	0 26788	4	0 32986	4	0 40497
5	0 17575	5	0 21768	5	0 26882	5	0 33100	5	0 40635
6	0 17638	6	0 21854	6	0 26976	6	0 33214	6	0 40773
7	0 17702	7	0 21923	7	0 27070	7	0 33328	7	0 40911
8	0 17765	8	0 22000	8	0 27165	8	0 33443	8	0 41050
28 9	0 17829	34 9	0 22078	40 9	0 27260	46 9	0 33559	52 9	0 41190
29 0	0 17893	35 0	0 22157	41 0	0 27355	47 0	0 33674	53 0	0 41330
1	0 17957	1	0 22235	1	0 27451	1	0 33790	1	0 41470
2	0 18022	2	0 22314	2	0 27547	2	0 33906	2	0 41611
3	0 18087	3	0 22393	3	0 27643	3	0 34023	3	0 41752
4	0 18151	4	0 22472	4	0 27739	4	0 34140	4	0 41893
5	0 18217	5	0 22552	5	0 27836	5	0 34258	5	0 42035
6	0 18282	6	0 22632	6	0 27933	6	0 34376	6	0 42178
7	0 18348	7	0 22712	7	0 28031	7	0 34494	7	0 42321
8	0 18413	8	0 22792	8	0 28129	8	0 34613	8	0 42464
29 9	0 18480	35 9	0 22873	41 9	0 28227	47 9	0 34731	53 9	0 42608
30 0	0 18546	36 0	0 22953	42 0	0 28325	48 0	0 34851	54 0	0 42753
1	0 18612	1	0 23035	1	0 28424	1	0 34971	1	0 42898
2	0 18679	2	0 23116	2	0 28523	2	0 35091	2	0 43043
3	0 18746	3	0 23198	3	0 28622	3	0 35211	3	0 43188
4	0 18813	4	0 23280	4	0 28722	4	0 35332	4	0 43334
5	0 18880	5	0 23362	5	0 28822	5	0 35453	5	0 43481
6	0 18948	6	0 23444	6	0 28922	6	0 35575	6	0 43628
7	0 19016	7	0 23527	7	0 29023	7	0 35697	7	0 43775
8	0 19084	8	0 23610	8	0 29124	8	0 35820	8	0 43923
30 9	0 19152	36 9	0 23694	42 9	0 29225	48 9	0 35943	54 9	0 44072
31 0	0 19221	37 0	0 23777	43 0	0 29327	49 0	0 36066	55 0	0 44221
1	0 19289	1	0 23861	1	0 29429	1	0 36190	1	0 44370
2	0 19358	2	0 23945	2	0 29531	2	0 36313	2	0 44520
3	0 19427	3	0 24029	3	0 29634	3	0 36438	3	0 44671
4	0 19497	4	0 24114	4	0 29737	4	0 36563	4	0 44821
5	0 19567	5	0 24199	5	0 29840	5	0 36688	5	0 4497
6	0 19637	6	0 24284	6	0 29944	6	0 36814	6	0 4512
7	0 19707	7	0 24370	7	0 30048	7	0 36940	7	0 4527
8	0 19777	8	0 24456	8	0 30152	8	0 37066	8	0 454
31 9	0 19848	37 9	0 24542	43 9	0 30257	49 9	0 37193	55 9	0 41

TABLE III,—*Apjohn's Hygrometric Tables.—(Continued.)*

Degrees of Fahrenheit's Thermometer, and Tension of Vapour in Inches of Mercury.

Ther.	Tension.	Ther.	Tension.	Ther.	Tension.	Ther.	Tension.	Ther.	Tension.
°		°		°					
56.0	0.45736	62.0	0.55881	68.0	0.68072	74.0	0.82671	80.0	1.00094
.1	.0.45890	.1	0.56067	.1	0.68295	.1	0.82937	.1	1.00411
.2	.0.46045	.2	0.56253	.2	0.68518	.2	0.83204	.2	1.00729
.3	.0.46200	.3	0.56440	.3	0.68742	.3	0.83472	.3	1.01048
.4	.0.46355	.4	0.56627	.4	0.68966	.4	0.83740	.4	1.01368
.5	.0.46511	.5	0.56815	.5	0.69191	.5	0.84009	.5	1.01688
.6	.0.46668	.6	0.57003	.6	0.69417	.6	0.84279	.6	1.02010
.7	.0.46825	.7	0.57192	.7	0.69644	.7	0.84550	.7	1.02333
.8	.0.46982	.8	0.57381	.8	0.69871	.8	0.84821	.8	1.02656
56.9	.0.47140	62.9	0.57572	68.9	0.70099	74.9	0.85094	80.9	1.02980
57.0	.0.47299	63.0	0.57762	69.0	0.70328	75.0	0.85367	81.0	1.03306
.1	.0.47458	.1	0.57954	.1	0.70557	.1	0.85640	.1	1.03632
.2	.0.47617	.2	0.58145	.2	0.70787	.2	0.85915	.2	1.03959
.3	.0.47777	.3	0.58338	.3	0.71017	.3	0.86191	.3	1.04287
.4	.0.47937	.4	0.58531	.4	0.71249	.4	0.86467	.4	1.04616
.5	.0.48098	.5	0.58724	.5	0.71481	.5	0.86744	.5	1.04946
.6	.0.48260	.6	0.58918	.6	0.71713	.6	0.87022	.6	1.05277
.7	.0.48422	.7	0.59113	.7	0.71947	.7	0 87301	.7	1.05609
.8	.0.48584	.8	0.59308	.8	0.72181	.8	0.87581	.8	1.05942
57.9	.0.48747	63.9	0.59504	69.9	0.72416	75.9	0.87861	81.9	1.06276
58.0	.0.48911	64.0	0.59701	70.0	0.72651	76.0	0.88143	82.0	1.06611
.1	.0.49075	.1	0.59898	.1	0.72888	.1	0.88425	.1	1.06946
.2	.0.49239	.2	0.60096	.2	0.73125	.2	0.88708	.2	1.07283
.3	.0.49404	.3	0.60295	.3	0.73362	.3	0.88992	.3	1.07621
.4	.0.49570	.4	0.60493	.4	0.73601	.4	0 89276	.4	1.07959
.5	.0.49736	.5	0,60693	.5	0.73840	.5	0.89562	.5	1.08399
.6	.0.49902	.6	0.60893	.6	0.74079	.6	0.89848	.6	1.08640
.7	.0.50070	.7	0.61093	.7	0.74320	.7	0.90135	.7	1.08981
.8	.0.50237	.8	0.61295	.8	0.74561	.8	0.90423	.8	1.09324
58.9	.0.50405	64.9	0.61497	70.9	0.74803	76.9	0.90712	82.9	1.09668
59.0	.0.50574	65.0	0.61700	71.0	0.75046	77.0	0.91001	83.0	1.10012
.1	.0.50743	.1	0.61903	.1	0.75289	.1	0.91292	.1	1.10357
.2	.0.50912	.2	0.62107	.2	0.75533	.2	0.91583	.2	1.10704
.3	.0.51083	.3	0.62311	.3	0.75778	.3	0.91875	.3	1.11052
.4	.0.51253	.4	0.62516	.4	0.76024	.4	0.92168	.4	1.11400
.5	.0.51425	.5	0.62722	.5	0.76270	.5	0.92462	.5	1.11750
.6	.0.51596	.6	0.62928	.6	0.76517	.6	0.92757	.6	1.12100
.7	.0.51769	.7	0.63135	.7	0.76765	.7	0.93053	.7	1.12452
.8	.0.51942	.8	0.63343	.8	0.77013	.8	0.93349	.8	1.12804
59.9	.0.52115	65.9	0.63551	71.9	0.77262	77.9	0.93647	83.9	1.13158
60.0	.0.52289	66.0	0.63760	72.0	0.77572	78.0	0.93945	84.0	1.13512
.1	.0.52463	.1	0.63970	.1	0.77763	.1	0.94244	.1	1.13868
.2	.0.52638	.2	0.64180	.2	0.78015	.2	0.94544	.2	1.14224
.3	.0.52814	.3	0.64390	.3	0.78267	.3	0.94845	.3	1.14582
.4	.0.52990	.4	0.64702	.4	0.78520	.4	0.95146	.4	1.14941
.5	.0.53166	.5	0.64814	.5	0.78774	.5	0.95449	.5	1.15300
.6	.0.53343	.6	0.65026	.6	0.79028	.6	0.95752	.6	1.15661
.7	.0.53521	.7	0.65240	.7	0.79283	.7	0.96057	.7	1.15923
60.8	.0.53699	.8	0.65454	.8	0.79539	.8	0.96362	.8	1.16385
60.9	.0.53878	66.9	0.65668	72.9	0.79796	78.9	0.96668	84.9	1.16749
61.0	.0.54058	67.0	0 65884	73.0	0.80054	79.0	0.96975	85.0	1.17114
.1	.0.54238	.1	0.66099	.1	0.80312	.1	0 97283	.1	1.17480
.2	.0.54418	.2	0.66316	.2	0.80571	.2	0.97592	.2	1.17846
.3	.0.54599	.3	0.66534	.3	0.80831	.3	0.97902	.3	1.18214
.4	.0.54781	.4	0.66751	.4	0.81091	.4	0.98212	.4	1.18583
.5	.0.54963	.5	0.66970	.5	0.81353	.5	0.98523	.5	1.18953
.6	.0.55145	.6	0.67189	.6	0.81615	.6	0.98836	.6	1.19324
.7	.0.55328	.7	0.67409	.7	0.81878	.7	0.99149	.7	1.19696
.8	.0.55512	.8	0.67629	.8	0.82141	.8	0.99463	.8	1.20070
61.9	.0.55697	67.9	0.67850	73.9	0.82406	79.9	0.99778	85.9	1.20444

TABLE III,—*Apjohn's Hygrometric Tables.—(Continued.)*

Degrees of Fahrenheit's Thermometer, and Tension of Vapour in Inches of Mercury.

Ther.	Tension.	Ther.	Tension.	Ther.	Tension,	Ther.	Tension.	Ther.	Tension.
°									
86.0	1 20819	92 0	1 45385	98 0	1 74404	104 0	2 08563	110 0	2 48630
1	1 21196	1	1 45831	1	1 74929	1	2 09180	1	2 49353
2	1 21573	2	1 46277	2	1 75456	2	2 09799	2	2 50078
3	1 21952	3	1 46725	3	1 75984	3	2 10419	3	2 50805
4	1 22331	4	1 47174	4	1 76513	4	2 11041	4	2 51533
5	1 22712	5	1 47624	5	1 77044	5	2 11665	5	2 52363
6	1 23093	6	1 48076	6	1 77577	6	2 12291	6	2 52995
7	1 23476	7	1 48529	7	1 78111	7	2 12918	7	2 53729
8	1 23860	8	1 48983	8	1 78646	8	2 13546	8	2 54465
86 9	1 24245	92 9	1 49438	98 9	1 79182	104 9	2 14177	110 9	2 55202
87 0	1 24631	93 0	1 49895	99 0	1 79721	105 0	2 14809	111 0	2 55942
1	1 25018	1	1 50353	1	1 80260	1	2 15442	1	2 56684
2	1 25407	2	1 50812	2	1 80801	2	2 16078	2	2 57427
3	1 25796	3	1 51272	3	1 81344	3	2 16715	3	2 58173
4	1 26186	4	1 51734	4	1 81888	4	2 17354	4	2 58920
5	1 26578	5	1 52197	5	1 82433	5	2 17994	5	2 59669
6	1 26971	6	1 52661	6	1 82980	6	2 18636	6	2 60421
7	1 27364	7	1 53127	7	1 83529	7	2 19280	7	2 61174
8	1 27759	8	1 53593	8	1 84079	8	2 19926	8	2 61929
87 9	1 28155	93 9	1 54061	99 9	1 84630	105 9	2 20573	111 9	2 62686
88 0	1 28552	94 0	1 54531	100 0	1 85183	106 0	2 21222	112 0	2 63445
1	1 28950	1	1 55002	1	1 85738	1	2 21873	1	2 64206
2	1 29350	2	1 55474	2	1 86294	2	2 22525	2	2 64969
3	1 29751	3	1 55947	3	1 86851	3	2 23179	3	2 65734
4	1 30152	4	1 56422	4	1 87410	4	2 23835	4	2 66501
5	1 30555	5	1 56898	5	1 87970	5	2 24493	5	2 67270
6	1 30959	6	1 57375	6	1 88532	6	2 25152	6	2 68041
7	1 31364	7	1 57853	7	1 89095	7	2 25813	7	2 68814
8	1 31770	8	1 58333	8	1 89660	8	2 26476	8	2 69589
88 9	1 32177	94 9	1 58814	100 9	1 90227	106 9	2 27141	112 9	2 70365
89 0	1 32585	95 0	1 59297	101 0	1 90795	107 0	2 27807	113 0	2 71144
1	1 32995	1	1 59781	1	1 91364	1	2 28475	1	2 71925
2	1 33406	2	1 60266	2	1 91935	2	2 29145	2	2 72708
3	1 33818	3	1 60752	3	1 92508	3	2 29817	3	2 73493
4	1 34231	4	1 61240	4	1 93082	4	2 30490	4	2 74280
5	1 34645	5	1 61729	5	1 93658	5	2 31165	5	2 75069
6	1 35060	6	1 62220	6	1 94235	6	2 31842	6	2 75860
7	1 35477	7	1 62712	7	1 94814	7	2 32521	7	2 76653
8	1 35895	8	1 63205	8	1 95394	8	2 33201	8	2 77448
89 9	1 36313	95 9	1 63700	101 9	1 95976	107 9	2 33883	113 9	2 78245
90 0	1 36733	96 0	1 64195	102 0	1 96560	108 0	2 34567	114 0	2 70944
1	1 37155	1	1 64693	1	1 97145	1	2 35253	1	2 79845
2	1 37577	2	1 65191	2	1 97732	2	2 35941	2	2 80648
3	1 38001	3	1 65691	3	1 98320	3	2 36631	3	2 81453
4	1 38425	4	1 66193	4	1 98909	4	2 37322	4	2 82261
5	1 38851	5	1 66696	5	1 99501	5	2 38015	5	2 83070
6	1 39278	6	1 67200	6	2 00094	6	2 38710	6	2 83882
7	1 39707	7	1 67705	7	2 00688	7	2 39406	7	2 84695
8	1 40136	8	1 68212	8	2 01284	8	2 40105	8	2 85511
9	1 40567	96 9	1 68721	102 9	2 01882	108 9	2 40805	114 9	2 86329
0	1 40999	97 0	1 69230	103 0	2 02482	109 0	2 41507	115 0	2 87148
1	1 41432	1	1 69741	1	2 03083	1	2 42211	1	2 87970
2	1 41867	2	1 70254	2	2 03685	2	2 42917	2	2 88794
3	1 42302	3	1 70768	3	2 04289	3	2 43625	3	2 89621
4	1 42739	4	1 71283	4	2 04895	4	2 44335	4	2 90449
5	1 43177	5	1 71800	5	2 05502	5	2 45046	5	2 91279
6	1 43616	6	1 72318	6	2 06111	6	2 45759	6	2 92111
7	1 44057	7	1 72837	7	2 06772	7	2 46474	7	2 92946
8	1 44498	8	1 73358	8	2 07334	8	2 47192	8	2 93783
91 9	1 44941	97 9	1 73880	103 9	2 07948	109 9	2 47909	115 9	2 94622

TABLE III,—*Apjohn's Hygrometric Tables.—(Continued.)*

Degrees of Fahrenheit's Thermometer, and Tension of Vapour in Inches of Mercury.

Ther.	Tension.	Ther.	Tension.	Ther.	Tension.	Ther.	Tension.	Ther.	Tension.
°	In. decls.	°	In decls.	°	In. decls.	°	In. decls.	°	In. decls.
116.0	2.95462	122.0	3.50003	128.0	4.13290	134.0	4.86758	140.0	5.70735
1	2.96306	1	3.50983	1	4.14425	1	4.87768	1	5.72242
2	2.97131	2	3.51965	2	4.15563	2	4.89081	2	5.73751
3	2.97998	3	3.52950	3	4.16704	3	4.90397	3	5.75264
4	2.98848	4	3.53938	4	4.17847	4	4.91716	4	5.76181
5	2.99699	5	3.54928	5	4.18993	5	4.93039	5	5.78301
6	3.00553	6	3.55920	6	4.20142	6	4.94364	6	5.79824
7	3.01409	7	3.56915	7	4.21294	7	4.95693	7	5.81351
8	3.02267	8	3.57912	8	4.22449	8	4.97025	8	5.82882
116.9	3.03128	122.9	3.58911	128.9	4.23606	134.9	4.98360	140.9	5.84416
117.0	3.03990	123.0	3.59913	129.0	4.24766	135.0	4.99698	141.0	5.85953
1	3.04855	1	3.60918	1	4.25929	1	5.01039	1	5.87494
2	3.05722	2	3.61926	2	4.27095	2	5.02383	2	5.89038
3	3.06591	3	3.62935	3	4.28264	3	5.03731	3	5.90587
4	3.07463	4	3.63947	4	4.29435	4	5.05082	4	5.92138
5	3.08336	5	3.64962	5	4.30609	5	5.06435	5	5.93693
6	3.09212	6	3.65979	6	4.31786	6	5.07792	6	5.95252
7	3.10090	7	3.66999	7	4.32966	7	5.09152	7	5.96814
8	3.10970	8	3.68021	8	4.34149	8	5.10516	8	5.98380
117.9	3.11852	123.9	3.69045	129.9	4.35334	135.9	5.11882	141.9	5.99950
118.0	3.12737	124.0	3.70072	130.0	4.36522	136.0	5.13252	142.0	6.01522
1	3.13624	1	3.71102	1	4.37713	1	5.14625	1	6.03099
2	3.14513	2	3.72134	2	4.38908	2	5.16001	2	6.04079
3	3.15404	3	3.73179	3	4.40105	3	5.17381	3	6.06263
4	3.16297	4	3.74206	4	4.41305	4	5.18764	4	6.07850
5	3.17193	5	3.75247	5	4.42507	5	5.20149	5	6.09441
6	3.18091	6	3.76289	6	4.43713	6	5.21538	6	6.11036
7	3.18992	7	3.77334	7	4.44921	7	5.22931	7	6.12634
8	3.19894	8	3.78382	8	4.46133	8	5.24326	8	6.14236
118.9	3.20799	124.9	3.79431	130.9	4.47347	136.9	5.25725	142.9	6.15841
119.0	3.21706	125.0	3.80484	131.0	4.48564	137.0	5.25127	143.0	6.17450
1	3.22616	1	3.81539	1	4.49784	1	5.25532	1	6.19063
2	3.23527	2	3.82597	2	4.51007	2	5.29941	2	6.20679
3	3.24441	3	3.83658	3	4.52233	3	5.31353	3	6.22299
4	3.25358	4	3.84721	4	4.53462	4	5.32768	4	6.23923
5	3.26276	5	3.85787	5	4.54694	5	5.34187	5	6.25550
6	3.27197	6	3.86855	6	4.55928	6	5.35608	6	6.27181
7	3.28120	7	3.87926	7	4.57166	7	5.37033	7	6.28816
8	3.29046	8	3.88999	8	4.58407	8	5.38462	8	6.30454
119.9	3.29974	125.9	3.90076	131.9	4.59650	137.9	5.39893	143.9	6.32096
120.0	3.30904	126.0	3.91154	132 0	4.60896	138.0	5.41328	144.0	6.33742
1	3.31836	1	3.92236	1	4 62146	1	5.42767	1	6.35391
2	3.32771	2	3.93320	2	4.63399	2	5.44208	2	6.37045
3	3.33708	3	3.94406	3	4.64654	3	5.45653	3	6.38701
4	3.34648	4	3.95496	4	4.65912	4	5.47102	4	6.40362
5	3.35590	5	3.96588	5	4.67174	5	5.48553	5	9.42027
6	3.36534	6	3.97682	6	4.68438	6	5.50008	6	6.43695
7	3.37480	7	3.98780	7	4.69706	7	5.51467	7	6.45366
8	3.38429	8	3.99880	8	4.70976	8	5.52928	8	6.47042
120.9	3.39381	126.9	4.00982	132.9	4.72249	138.9	5.54394	144.9	6.48722
121.0	3.40334	127.0	4.02087	133.0	4.73526	139.0	5.55862	145.0	6.50406
1	3.41290	1	4.03196	1	4.74805	1	5.57334	1	6.52093
2	3.42249	2	4.04306	2	4.76088	2	5.58809	2	6.53785
3	3.43210	3	4.05420	3	4.77373	3	5.60288	3	6.55480
4	3.44173	4	4.06536	4	4.78662	4	5.61770	4	6.57179
5	3.45139	5	4.07655	5	4.79954	5	5.63256	5	6.58878
6	3.46107	6	4.08776	6	4.81248	6	5.64745	6	6.60584
7	3.47077	7	4.09901	7	4.82546	7	5.66237	7	6.62293
8	3 48050	8	4.11028	8	4.83847	8	5.67733	8	6.64007
121.9	3.43025	127.9	4.12157	133.9	4.85151	139.9	5.69232	145.9	6.65725


Geological Map of the
MOUNTAIN PROVINCES
BETWEEN THE RIVERS
SUTLUJ AND KALEE
By
CAPTAIN J. D. HERBERT
Supt. Hon. Survey Himalaya Mountains
1826
Published to accompany Captain Herbert's Report
Journal of the Asiatic Society 1842 VOL. XI APPENDIX
A Granite
B Gneiss
C Micaceous Schist
D Chlorite Schist
E Argillaceous Schist
F Limestone
G Hornblende Schist
H Newer Red Sandstone
I Diluvial Beds
CHINESE TARTARY
HIMALAYA
SNOWY MOUNTAINS
LADAK
MUNDEE
Lake Rakwun Rhud
Lake Munsurwara
Tuklakot
Dunka Station
CHAMPAWUT
ALMORA
SIRENUGER
REMARKS
Scale 16 Miles to One Inch

Geological Map of Captain Herbert's *Himalaya Survey.*

With the present number the Editors of the Journal have the extreme satisfaction of presenting to its readers, and to the scientific world in general, Captain Herbert's Geological Map of his Survey, of which the Report was published by the late Editor and Proprietor, *gratis* to subscribers, as a supplementary number to Vol. XI of the Journal.* The introductory notice to that report will fully explain under what circumstances it was obtained and published. It is to the attentive recommendation of the Government of India, and the ever ready assistance of the Court of Directors, that the Asiatic Society and the scientific world are indebted for this noble proof of what has been done in former days by the Government for the advancement of this branch of science; and if it be considered that the Map and Memoir now date nearly twenty years back, (the Survey was of course previous to it,) and that it is still the only connected geological sketch we have of this great and interesting tract of country, where so many magnificent geological problems yet lie unsolved, and perhaps even unthought of, its importance as a preliminary draft for more detailed and accurate delineation, may, as we have elsewhere stated,† be best appreciated by those who can remember or refer to the geological labours of Smith and the earlier Continental geologists, not many years before its date. We should not also forget that the Report itself was but a *first* one, and therefore, like the Map, but a sketch of what more detailed and minute examination are wanting to render perfect.—Eds.

* A large margin has been purposely made on the left hand margin of the plate, so that it can be taken out of this number, and pasted into the volume, in its place at the end of the Report, by those who have it bound up.

† Proceedings Asiatic Society for March, Report Curator Geological and Mineralogical Departments.

Notes on Moorcroft's Travels in Ladakh, and on Gerard's Account of Kunáwar, including a general description of the latter district. By Lieutenant J. D. CUNNINGHAM, *of the Engineers*, 1843. *Communicated by the Government of India.*

GENERAL ACCOUNT OF KUNAWAR.

Situation, &c.—The Sutlej rises in central Tibet among the ravines of the holy hill of Grangi, and after a north-westerly course of 150 miles, it is enabled to turn at right angles, and to thread its way among the steeps of the Himalayas to the plains of India. The Himalayas are about fifty leagues in breadth, and the upper but smaller half of the basin of the river within them, may be considered as the district of Kunawar. When about to quit Tibet, the Sutlej receives a considerable accession of water from the north-west, but on its way through the mountains, it has no tributary of a greater length than thirty-five miles, and Kunawar may be said to be about seventy miles long by forty and twenty broad at its northern and southern extremities respectively.

The hydrographical basin of the Sutlej no where opens into a broad plain, and Kunawar consists of a series of rocky and precipitous ravines descending rapidly to the bed of the principal river. The greater part of the district lies to the north of the main ridge of the mountains, and the moderate rains which aid in covering their southern and central off-shoots with forests, are unfelt towards the Tibet border. Vegetation thus loses its great encourager, and the natural disintegration of the granite, gneiss, slate and other ancient rocks scarcely anywhere affords a sufficient substratum of soil. Trees which are numerous in Lower Kunawar, disappear towards the north; and where the district bounds with Ladakh and Gáro, scarcely one is to be seen that has not been planted by the hand of man.

Scenery, &c.—The scenery is indeed grand, but its vastness and barrenness in Upper Kunawar are fatiguing. Steep rises above steep, and the lofty summits of the hill, the fancied abode of spirits, are lost in clouds; while far below the broad and foaming river is only distinguishable as a silver-like line. Torrents dash swiftly from rock to rock, turning and writhing in yawning gulphs amid the ruins of

hills, or leaping from high impending cliffs, they are dissipated in spray. So vast indeed are these mountains, and to such heights do they at once attain, that gloomy forests of the tallest pines appear but as grass, and give a colour, rather than a feature, to the precipitous sides. Among the northernmost Himalayas, scenes of such naked grandeur are frequent, but I do not remember any pleasing from their variety, or such as we would term picturesque from their contrasts; and the admirer of *nature adorned*, should not perhaps go beyond Nachár, and certainly not beyond Chiní, where he may revel amid scenes of surpassing luxuriance and beauty.

Culturable Spots.—It used to be an opinion, that the world was at first made as we now find it, and that the channels of rivers were at once created of the depth and breadth we now see them; but geological research has proved, that nature is usually slow in her operations; that the Himalayas may have been raised from the bottom of an ocean; and that the Sutlej certainly was, at a time subsequent to the last great movements, a series of lakes of various sizes. Time has enabled the river to wear away all its impediments, sometimes four hundred feet perpendicular through rock, and it now forms one stream of rapid but equable descent throughout its mountain course. The existence of the lakes in the Sutlej and its tributaries is still attested by horizontal deposits of alluvium at various heights above their present channels, and the beds of these pools still form almost the only cultivated land in Upper Kunawar, for they yield a good soil, and admit of a stream of water from one torrent or another being brought to bear on their inclined and non-terraced surfaces. In Middle and Lower Kunawar, moderate rain and decaying vegetation give more aid to the husbandman, and hanging gardens, vineyards, and fields of many colours add variety and richness to the landscape.

Climate, Seasons, &c.—When the Sutlej turns to cross the Himalayas its channel is about eight thousand five hundred feet above the sea, and in its direct course of seventy miles to the limits of Kunawar, it descends to half that elevation. The villages are usually much higher than this base line, and fields of grain are produced almost two miles and a half above the level of the sea. In Middle Kunawar, the cultivated spots have an average altitude of about seven thousand feet, and it is here in a genial climate, and remote from the heavy rains

of the south, that grapes are produced in abundance. Here during the summer and autumn, the air is cool and the scenery pleasing. The winters too are comparatively mild, and had nature expanded the basis of the Sutlej, so as to allow of plains and brooks, instead of steeps and torrents, the district would have rivalled the most favoured valleys of the Himalayas.

In all countries the spring and summer are welcome, but in this land of snow the reviving vegetation, the tender shoots of each well-known tree, and the coming buds of each simple flower impart to man some of the cheerfulness of the birds which flutter and twitter around him. The scanty and laborious cultivation of each solitary hamlet appears as a gem of price amid the wilderness of hills and rocks, the slight and occasional tinge of green gives a beauty to the desert; it is the evidence of renewed life, and the heart of the peasant expands with joy. He may well remember the season gone by, for in Upper Kunawar and in Tibet, the winter is long and rigorous. Snow may be expected by the middle of November, and it continues to fall until the end of February, accompanied by a strong and piercing wind; the mercury descends below zero, "the air burns frore," and man almost envies the torpidity of the less perfect animals. Hills of snow are heaped high upon hills, range retires far beyond range, and naught relieves the drear and hoary waste or interferes with the awful stillness of the scene, save perhaps a dark and frowning precipice, or the voice of the blue river below, struggling with its fetters of rocks and ice. In contemplating these vast solitudes, illumined by the setting sun, the mind of man is for a moment raised, and he feels and admires their sublimity. He stands majestic, the sole living being on the circumference of a world, but of a world half-formed or in ruin, or not fitted for him. The broad expanse of desolation wearies and appals; the fatal cold and the waning day recal other thoughts, and he turns silent and subdued to seek relief and sympathy among his fellow-mortals, and in the ordinary occupations of life.

In Kunawar, thunder and lightning are rare; but they sometimes occur at short intervals during the summer months. In these lofty regions, however, the flash is dim, and the sound is unheeded by the beasts of the field. Light showers occur in April, June, and September, and sometimes in other months; but they are not sufficient for

the purposes of agriculture. The wind is usually or nearly always from the S. or S. W., and in winter it blows with great violence.

Geology Metals.—Kunawar is an interesting field to the venturous geologist. The accumulation of ages in the dark recesses of a displaced ocean are now in middle air, and their structure, chemical or mechanical, stands revealed in sections, broad, high, and precipitous. The vast extent of the strata in breadth and depth, their tortuousness, their great dip, and their occasional approach to perpendicularity, all declare, that they have been raised from the deep by forces surpassing far the subterraneous efforts of Italy and Iceland; while torrents of molten mineral have been urged with volcanic fury through the heavy and rending bed of the ocean, and now appear as veins of granite and quartz, ramifying from the base towards the summit of mountains of gneiss and slate. The granite is always seen, (and sometimes in large masses which might elsewhere be termed hills,) but it does not constitute the bulk of a mountain, or everywhere compose the crest of a range, as we are usually told of this "first of rocks." The limits of the primeval floods of middle Asia, and the successive geological conditions of the tract are yet to be ascertained, but about the junction of the Petti and Sutlej, the gneiss would seem to yield by degrees to limestone, slate, gypsum and crystalline sandstone, (see also Captain Hutton's Report.) Shining shallows and shingly beaches may here have been found investing some ancient promontory, or forming the coast of an inland sea, for multitudes of ammonites and other shells give proof of organic life and of the means of sustaining it, while abundance of pebbles and rounded rocks, various in size and in kind, scattered about the highest Passes, give some evidence of tidal action.

Veins of copper occur in one place in Kunawar, and some grains of gold have been found in the beds of its streams. There is a lead mine in the adjoining district of Pétti. Other metals are perhaps to be met with, but difficulty of access would render all unproductive as merchandize, save those of the precious or rarer kinds.

Animals.—Kunawar has no animals peculiar to itself. In the lower districts, several of the deer kind are found, including the one which produces musk. Bears and leopards, jackalls, foxes, and horses are not uncommon, and the wolf or gaunt, wild dog occasion-

ally appears in search of food. The feathered tribes are numerous, but the soaring eagle, the Piara of the pheasant kinds, and the king of birds as he is called, need only be particularly mentioned. Numerous flowers enable the industrious bee to lay in a goodly store of honey.

In Upper Kunawar, the animal kingdom is less rich and varied, but the ibex and wild sheep baffle the impatient and wearied sportsman, and the hair of a blueish tinge betokens an arctic climate. The burrowing rat, a few jackalls, and perhaps foxes, an occasional leopard of a pale colour, and the brighter spotted, lynx-like, cat, complete the list of resident animals. Packs of wild dogs sometimes show themselves, but the Këang, or wild ass of the rocky desert, is found only to the northward of the British possessions. The birds are almost confined to crows and ravens, the sparrows, and two beautiful varieties of the red-breast, to pale blue and white pigeons, to the gigantic partridge dwelling near the snow, and the red-legged francoline of delicious flavour. Occasionally, a black plumed eagle may be seem swooping on his prey, a few hawks show themselves, and the ripening crops bring to each village some of the pigeons and doves of India; while the wild-duck is sometimes met winging its way from that country to the lakes of Tibet. A few snakes, lizards, and scorpions almost comprise the reptile kingdom. The insects are more various; but beetles, moths and butterflies, grasshoppers, spiders, and a diminutive gnat or musquito, added to the ubiquitous house fly, the indefatigable ants, and the numerous parasites, need only be alluded to. Of fish it may be said, speaking generally, that there are none in the remotest parts of Kunawar, and yet a few must exist, as an otter is sometimes met with. The mysterious *gangball*, or snow fish, with four short legs and a human face, may be in fact as in description, a fabled animal; but it is talked of, and it is said to dwell only about the limits of the snow. Of domestic animals, it is sufficient to mention the shawl-wool goat, and the yâk or grunting ox. The under-clothing of the goat, however, is much inferior to the "*pushm*" of more northerly tracts, and the hybrid produce of the yâk is of more value, both for transport and the dairy than the genuine animal itself. The people have horses, asses, black cattle, sheep, dogs and cats; but there are no domestic fowls in these districts.

Trees, &c..—In Lower Kunawar, forests of oaks and pines cover the sides of the hills, and various other trees, shrubs and plants are found in every direction; but in the northern parts of the district, spontaneous vegetation almost disappears. An occasional juniper, a few scattered pines, and now and then, in the highest places, a clump of dwarf birches or of the mountain ash, relieve the eye of the traveller. Among the few shrubs, the spreading juniper, and the bush producing a leaf of a tea-like quality, are of most interest. In the adjacent Bhotee districts, these become more rare, and a few poplars and willows, and perhaps a few apricot trees are all that can readily be found, and they shew not the luxuriance of nature but the industry of man. The patches of furze, the scanty grass, a currant, a gooseberry or a rose bush, the broad leaf of either kind of rhubarb, a few hardy creepers, some pleasing flowers and a variety of shrubs and herbs which appear of no value, give a tinge only to the side of the lofty hills—green things, and even flowers, there are many if we begin to ennumerate them, but to man who wants food and shelter and clothing, they all seem profitless, and to the casual observer the barrenness seems entire.

Grains and Fruits.—Most kinds of grain, excepting rice, are cultivated throughout Kunawar. In the north, the varieties of the cockscomb or amaranthus are not found, but every available spot is cut into steps and covered with wheat, barley, peas, beans, buck-wheat, and millet. The millet and buck-wheat are the second crop of a few favoured places, and peas and beans are grown in small quantities as a pleasing addition to the daily food. Here are several kinds of barley, but the beardless variety yields perhaps the best crop. Turnips are sown when the wheat and barley have been reaped, and they are eaten fresh or partially dried, and laid by as store for early winter. A kind of onion is cultivated, and where there are no apricot trees, the people endeavour to raise the surson or mustard plant for the purpose of obtaining oil. Abundance of grapes and apricots, some walnuts, apples and peaches are produced in Upper and Middle Kunawar, and the Chilghoza pine is here met with as a principal tree of the forest. Towards the Tibet frontier the fruits decrease in quantity, and in the adjoining districts of Ladkh and Gáro they disappear altogether. The apricot does not produce at a greater elevation than 10,500 feet, and the grapes are inferior at 9,000.

Race, &c.—The Kunawarees are of the Caucasian race, that is, they are not characterized by the broad features of the Tibetans, and may be of Hindoo origin, as they claim to be; but Brahminism has not yet obtained a mastery among them, and they are more tinged with the manners and religion of Tibet than with those of India. They know little or nothing of their own history, but they are most likely colonists, and they have still among them a separate race regarded as inferior. The people though possessed of some spirit are not warlike, they are peaceful agriculturists, and not a race of robbers. Crimes of great atrocity are rare, nor can it be said, that those which affect property are common. Compared with the people of the plains of India, they may be termed a simple race, without supposing them unimbued with the ordinary evil passions of our nature, as might be inferred from descriptions of some travellers.

Government.—Kunawar is the largest subdivision of the Bìssèhìr principality. The chief is absolute, but here as elsewhere, he must be guided by immemorial usage. The district is managed by hereditary superintendents or viziers, who collect the revenues which are fixed, and levied chiefly in cash, but partly in kind. Each village has its head man responsible for its good behaviour. The lands are divided among a certain number of families, and each house, besides the taxes, provides the Raja with a soldier, and also with a servant or porter when required.

The Bìssèhìr principality had for ages subsisted as independent, carrying on occasional wars with the adjacent states of Kùlù, Ladakh, Chaprang and Garhwál; but it yielded to the Gorkhas, and on the conclusion of our war with the Nepalese, it became a British dependency. It pays to the Indian Government a tribute of rupees 15,000 annually; the revenues of the principality have been recently estimated at 1,40,000 rupees.

Religion.—In northern Kunawar, Buddhistic Lamaism is prevalent, but in the middle and south, the people are left to their local gods, and to the oracular priests of these divinities. Every hill is supposed to be the abode of a *deötá*, who owns the undefined power of some mighty Being above all.

Social relations.—The Kunawarees are all Polyandrists, *i. e.* one house or family has usually but one wife only, and she is considered

as more particularly the wife of the eldest brother. This institution is necessary to limit population, where it is impossible to extend agriculture, where mineral wealth has not been developed, and where the people have scarcely begun to carry on an extensive and profitable trade.

Trade, &c.—The want of organized priesthood, and the institution of Polyandry are the only circumstances connected with the social condition of this people that need be separately mentioned. They are mostly agriculturists, but do not on the whole produce as much as they consume; all have some flocks and herds, and the people of the north have of late become enterprizing traders. They proceed to Leh to buy the drug called *charas,* and to Goro, and almost to the foot of the Karakorum range to procure shawl-wool. For these, they give in exchange money, cloths, and spices, and were the dangerous and difficult roads improved and kept in repair, the Kunawarees might soon become the principal carriers of the trade between middle Tartary and Upper India. At present, the paths are scarcely practicable for loaded mules, and the merchandize is chiefly carried on the backs of sheep and goats. All the people trade in a petty way, for they exchange woollens and fruits for grain and salt.

Food, Clothing, and Houses.—The Kunawarees live chiefly on corn, but meat is occasionally used by those in fair circumstances, and the latter also occasionally indulge in tea procured from Lassa. The people dress in woollens of their own manufacture at all seasons of the year, and towards the north, they add a skeepskin cloak during the winter. The women have a profusion of brass ornaments, and of shell or other beads. The men carry a flint and steel at their waist, and both sexes love to adorn themselves with gaudy flowers, the one most sought after being the French marigold. In the neighbourhood of the forests, their houses are built of wood and stone, and their temples are pretty in themselves, and picturesque in connection with the surrounding scenery. In the extreme north, the scarcity of wood makes the people content with mere hovels of mud and unhewn stone.

Notes on Moorcroft's Travels in Ladakh and on Gerard's account of Kunawar.

Religion of the Kunawarees,—Caste or Race in Kunawar and Tibet.—The religion of the mass of inhabitants (of Kunawar,) is Hin-

dooism, but they have no minute distinctions of caste. They rather burn or bury the dead at some distance from the villages where they erect gravestones; some of them profess the Lama religion, but that properly belongs to the Tartars. The goddess in greatest repute is *Kalee* in her most horrid form, to whom human sacrifices were offered at no distant period. I have heard of their taking place not more than twelve years ago, (1806-10?), and they existed at the famous temple of *Bheema Kalee* at Sooran, where the *Bussehur* Raja resides in summer at a later time, and were not finally abolished until the British Government got possession of the hill states in 1815.—*Gerard, p.* 83-86.

The Kunawarees proper, rich and poor, call themselves *Kauits*, a class which in the hills appears to take rank next to Rajpoots. They consider themselves of Indian origin, but they have no Brahmins among them, and the hopes and fears of the Kunawarees are chiefly placed on their local gods. In Upper Kunawar Bhuddhism has taken deep root, but it has not yet overcome the reverence of the people for the deotas or spirits of the hills. In all Kunawar there are but three temples dedicated to a divinity of the Brahmins. One of these is in the Bhotee district belonging to Bisseher, and is maintained by the Rajah in his frontier fort. The other two are at Ropeh near Sungnam, and at Kotee near Chini on the right bank of the Sutlej. (Captain Gerard, I observe, also places one in his map on the left bank of the river a few miles above Chini). None of these three temples are ministered by Brahmins, nor are human sacrifices offered to the form of *Kali* (*Chundika*,) there worshipped. Sarahan, which contains the temple of *Bheemakali* is not in Kunawar. There are, as I have said, no Brahmins in Kunawar, and Lamaism prevails in the upper-third of the district only. In the other two-thirds the people are without a priesthood, and each village worships one or more equal gods. These districts are under a prince of the Brahminical faith, but such a condition of society offers a fairer field to a Christian Missionary than the plains of India, where he has to encounter an organised priesthood, and the prejudices of a people satisfied with their present chance of salvation.

Caste, or at least distinction of race, is not unknown in Kunawar, and one, if not two separate tribes appear to have escaped Captain

Gerard's observation. These are the Kohlis, Chumars, or Chamangs; and the mechanics subdivided into smiths and carpenters. The Kohlis are so called by the people of the lower hills; in the plains by the people about Rampoor they are called Chumars; and by themselves and by the Kunawarees, Chumangs.

The Kohlis are regarded as out-casts; and no *Kauit* will intermarry with them, or eat with them, or even allow them to cross his threshold. They are in every way a distinct race in Kunawar, and have a language of their own, essentially Hindi, although mixed with some Arabic and Persian terms for which it may be difficult to account. To the southward, their language merges in that of the hill tribes generally. A specimen of their vocabulary is given under the heading "Language." It is not known whether they entered Kunawar as refugees, or have been left in it as a remnant; but they are most likely of the ancient *Sudra* stock of India. Their complexion is usually darker than that of the *Kauits*, and some are said to have woolly hair, as is the case with the tribes of the Vindhya hills.

Family Polyandryism is established among the Kohlis. Some few hold lands directly of the Government, and are otherwise on the same footing as *Kauits*, except that they are the first pressed as porters, a mode of rendering service to the chief usual in the Himalayas. They are commonly labourers and weavers. There are some families of Kohlis in almost every Kunawaree village; but they are not found in the adjoining Bhotee districts. They are the musicians of the villages.

The smiths or lohars are called *domang* in Kunawaree, and the carpenters are termed *oras*. In the eyes of the *Kauits*, they are outcasts equally with the Kohlis, neither do the artisans and Kohlis intermarry or eat with one another. There are two or more families of mechanics in each village. Polyandry is established. The language is the Kunawaree of the district in which they reside. They are pressed as labourers before the *Kauits*.

In the Bhotee districts adjoining Kunawar, the same person is both smith and carpenter, but he is usually styled smith or *loh*. He is regarded as unclean by the Bhotee cultivators, and they do not eat or intermarry with his family. His language is Bhotee, and Polyan-

dryism obtains.—In practice his sons and daughters do not become Lamas and Nuns, but the priesthood is not formally barred against them.

I heard that about Lassa and other considerable places, the potters *(kumhars,)* were regarded as outcasts, and as separate from the artisans.

In Kunawar where wood is plentiful, every one, however poor, is burnt, unless he die of a certain disease called *rimz*, (of the nature of which I made no note, but I remember it was not leprosy.) No one save Lamas have tombs or grave-stones in Kunawar; but the heirs of a man of substance, may, in the Buddist districts, build a temple jointly to his memory and to the glory of an emanation of Sakya.

Tribes—The Kampas, the Zjakpas.—Near our encampment, a Champa or shepherd and his family had encamped, and several other tents were near.—*Moorcroft*, II, 47.

There is a sect of wandering Tartars called Kampa, who are in some respects similar to the Jogees of Hindoosthan. They visit the sacred places, and many of them subsist wholly by begging. Some are very humourous fellows, they put on a mask, &c. &c.—*Gerard*, *p.* 117.

Now, (1842) the Kampas may be said to resemble the Kotchis of Affghanistan, rather than the Jogees of India, and Gerard's comparison may be particular rather than general. The Kampas are wandering shepherd traders. They are the chief carriers of borax. In winter they graze their flocks in the southern Himalayas, and in summer they proceed to Rohtak, Hanleh, &c. to procure borax and some other articles. They are Tibetans, and intermarry with Bhotees and with Kunawarees, see also Captain Hutton's Tour, (Jour. As. Soc. III, 17.) I am not certain whether the jugglers or maskers of Tibet are Kampas or not, but I think they are. I saw but one party only, and they considered Pitti to be their home, but wandered over a great extent of country.

I may here mention another tribe of men found in Tibet. These are the Zjakpas, a race of mounted plunderers, who infest the country between Leh and Lassa, but whose chief strongholds appear to be in the neighbourhood of the Mansarawar Lake. The Government occasionally finds it advisable to employ these men in the service

of the state, and during the late war with the Sikhs, a band of them accompanied the Lassa force under a leader named Pan Aghim. In Zjakpa we may find the same root as in Kazzak, a robber, and as in Uchakka, a thief.

Tribes—the Kalmaks and the people of Hor.—A considerable portion of the population of Khoten consisted formerly of Kalmak Tartars, but it is said that when the Chinese subjugated the province they deported the Kalmaks to the cities, which collectively constitute the modern city of Ila on the river of the same name, and to the adjacent districts.—*Moorcroft*, I, 381.

The people of Tibet whom I saw always, spoke of the Kalmaks or Sokos as a people dwelling in the countries beyond the Kavakorum range, and whose principal place was 'Eli.'—They described them as of the Gelukpa sect of Lamaism, and said, their present chief was a Lama named Jipchun Tampa, with the title Kaka, (*i. e.* Khakan or Chagan. Tampa may have some relation to the horse, Ta.)

In Sokpo we have no doubt the ancient Sacæ, for *po* is equally with æ, a termination. Our last maps place the Sacæ between Imans and Emodus or in western Tibet, but I doubt whether that country could ever have maintained hordes of horsemen, and the tracts north of Imans are perhaps their original, as they are their present, seats. I have indeed heard of a few Sokpos about Garo, but they are, so far as I could ascertain, emigrants, or the families of a paid soldiery.

The country about Yarkand and Eli, or Ila, is known in western Tibet, under the name of Hor, and the permanent conquest of Ladakh, or frequent inroads into it by these northern tribes, is still preserved in the memories of the Tibetans by the continued exaction of a tax named Hortal or the Hor tax. This tax is levied at the present day in for instance the district of Pitti; but I have not heard that the Chinese Government of Yarkand receives it from Ladakh as the people of Hor did of old; nor was I able to ascertain whether the imposition of the tax in question, was antecedent, or subsequent, to the Kalmak conquest of Ladakh, about the end of the 17th century.

In our maps, we place the mountains of Khor or Hor, and in our geographies, a *Mongol* tribe of the same name, to the north-east of the Mansarawar lake. There can be little doubt of the identity of this tribe of our histories, and of the people now known in Tibet under

the name of Hor, but the well-watered tracts about Yarkand seem better able to rear and to maintain a race of conquerors, than the sterile and rugged district near the heads of the Indus and Burrampooter. The present position of the Hor or Khor race also agrees well with that ascribed to the Chawranei of the ancients, and I think we may presume them to be the same.—*Csoma-de-Koros' Gram.* 6-19-6, identified the Hors with the Turks, and it may be worth enquiry whether Khorassan, Khwarizm, &c. be not connected with this race, and even whether the Gorkhas are not a colony of the same people, notwithstanding their alleged Indian descent. There are such colonies of distant Tartars in the Himalayas, as for instance the Lepchas near Darjeeling.

Religion,—Lamaism.—The Lamas wear red or yellow according to their order. The dress of the grand Lama at Lassa is yellow, but that of the chief Lamas in Ladahk is red —*Moorcroft,* II, 323.

The religion of Ladakh, like that of Tibet and China, is the worship of Buddha under a peculiar Hierarchy. Every family in which there is more than one son, furnishes a Lama or Gehem, who is at once a Canobite, and a family priest, attached to a monastic institution under a Lama or Abbot, ordinarily living amongst the people, and conducting the rites of their daily worship in their own houses, in which a chamber is usually appropriated to an image and attendant priest. The chief Lamas are appointed from Lassa, and continue to acknowledge the supremacy of the pontiff of that city. They all profess poverty and celibacy, but a man who has been married, is admissible into their order. There are also establishments of religious females called Chumas Anis. The Lamas, Gelums and Anis, or priests, monks, and nuns, are divided into two sects; the red, or old, and new or yellow priesthood.—*Moorcroft,* II, 339-40.

The religion is Lama. The Lamas in Kunawar are of three sects Geeloopa, Dookpa, and Neengma, but I could not hear of that called Shammar by Captain Turner. The Geloopas or Gelookpas are reckoned the highest, since the heads of their religion at Teshoo, Loomboo and Lahassa are of the same sect. They wear yellow cloth garments, and caps of the same of various shapes. The Dookpas are dressed indifferently but have red caps, and the Neengmas wear the same, or go bare-headed; the two former do not marry, but there is no

restriction on the Neengmas. The Lamas admit proselytes at all ages, and any one can become a Dookpa, Geloopa, or Neengma; the chief Gelong of Kamun said he would admit me. There are two other sects peculiar to Chinese Tartary, Sakeea who wear red, and Degooma, yellow caps. In Tibet, the chief of a monastery is called Lama, and the inferior orders are styled Gelong. Here, (Kunawur,) most of the clergy are named Lama, and the heads of the convents of Kamun, Labrung and Shealkur, are denominated Gelong and Geroo. Neither Gelongs nor nuns smoke tobacco, although the Lamas do; neither of them drink spirituous liquors. The Grand Lama of Lahassa, called Gealong Rimboche, who resides at Potala, is the chief pontiff of all the Lamas. The next in succession to the Grand Lama of Lahassa is Panchin Rimboche, of Teshoo Loomboo. The third in order is Lochawa Rimboche, these three personages are all of the Geloopa sect.—*Gerard, p.* 117-21.

(All that Moorcroft and Gerard say, should be read, as well as the above extracts.)

I am imperfectly acquainted with the results of the enquiries of the late Csoma-de-Koros, but we do not, I think, yet possess a full and accurate knowledge of Buddhism as it exists in Tibet, and all our accounts perhaps contain, like the above extracts, some error and confusion. Mr. Hodgson indeed, and others have thrown much light on Buddhism as a speculative religion, but it may be as difficult for us to explain the variety of sects at present existing from the study of Sanscrit or Tibetan books, as it would be for a learned stranger to infer Popery and Protestantism from a simple perusal of our own Scriptures. A complete knowledge of the present sects might enable our scholars to trace in many instances the peculiar tenets of different orders to their sources, and so give us much curious information regarding the progress of error from philosophical refinement to gross superstition; but this knowledge however desirable, is still to be acquired.

I heard of four principal sects of Lamas, 1st Gelukpá, 2nd Dúkpá, 3rd Ningmá, and 4th Sakhiá, to which may be added the peculiar sects of the Banbos and Pitchobás or Nangbátchos. Turner (Embassy, 314) mentions the Shammars, and says they include all the red sects. The word is, I presume, connected with the Shamanism of the ancients. Gerard alludes to "Deegromas," but of this sect I did not learn,

any thing and neither it, nor three of those I have mentioned are included by Csoma-de-Koros among his nine *principal* sects, (Grammar, p. 175.) Afterwards indeed (p. 194) that scholar says, there are *four* divisions comprehending eighteen sects, and it may be that these *divisions* correspond with Mr. Hodgson's four *systems* of speculative Buddhism. *(Lit. and Rel. of the Buddists, p. 33.)*

Notwithstanding its wide diffusion and great authority, I would define Buddhism to be the religion of a priesthood rather than of a people. In the abstract it does not diligently seek for proselytes, and it has but little active interest in the welfare of mankind. Its precepts appear to be silent about reclaiming the unbeliever, and about comforting the lowly and those who pass their days in toil. Its exhortations are towards asceticism, and it insists on a solitary communing with oneself and with God, as the surest road to a happy immortality, or to a speedy incorporation with the deity. This passive excellence produces indeed an indirect effect on the people, who believe their priests to be the chosen of Heaven, and who see that they avoid much of the fraud and violence usual in the world. It is also true, that the people are told of the punishment awaiting evil deeds, but the priest is always more intent on his own salvation than on exhorting the people to be good. He does not consider himself to be a teacher from God, or that *he* should seek to explain to *others* the means of attaining to excellence. The poor are without pastors, and can only be spectators of the religious service of the brotherhood of monks, nor perhaps do the devotions of the rich bring them nearer to God, although they have their private chapels, and attend while the priests offer their supplications to the Almighty. The indifference of the Lamas to the belief or practice of the people is well exhibited in Kunawar; temples erected to the spirits of the hills appear close to Buddhistic monuments, and the priest of a hierarchy share the veneration of the villagers with the creations of ignorance and fancy.

The votaries of Buddhism being taught that in order to attain to divinity, or to a speedy salvation, they must wholly abstract themselves from the affairs of the world; it forms a curious enquiry how this inactive and self-denying system became mixed with other faiths, and took a hold upon the mind of millions. If the persecuted Buddhists entered Tibet, and found a race without a

regular priesthood, the necessity of mixing with others, and the ambition natural to the human mind, may have led the successors of the more enthusiastic anchorites to take advantage of the ignorance of the people, and by degrees to institute a sort of hierarchy; not however, complete or rigorous, for persevering asceticism, or direct inspiration, will even now elevate the poor and the ignorant above the wealthy and the learned. On the other hand, we know but little of the state of Tibet when it was entered by the votaries of Buddha, and they *may* have met with a waning ministry of congenial speculatists. A subsequent union with the missionaries of another faith may have taken place, and may have encouraged the progress towards a regular hierarchy; and if the Nestorian Christians have produced any lasting effects on the belief or practices of Chinese Tartary, the impress will probably be found among the Gelukpa, a sect of Lamas, notwithstanding *their* celibacy, and the allowance of marriage by the Greek church. With the Gelukpas, priestcraft has, I think advanced further than with the others, and they may bear some marks of the training or system brought about by the heresies of the Church, after it had obtained authority and place in the empire. I am, however, very doubtful whether any certain trace of a corrupted Christianity can be found in Tibet itself, and I am not aware that auricular confession, or the worship of relics, obtains in the sense of the eastern and the western Churches.

All the three sects, Gelukpa, Ningma, and Dukpa, with which I have fallen in, insist upon the doctrines of transmigration and of absorption, and maintain a gradation of animals ending in man, through which the soul must pass before its final emancipation. During certain ceremonies, (corrupted ones indeed,) Lamas are seemingly possessed with the divinity. I have seen one who has been considered from his childhood as a "preseus Divus," and the ready faith of the people lays the mind prostrate in either case. All Lamas refuse to take animal life, and some of superior sanctity observe their doctrine, and also refuse to take vegetable life; that is, they will not themselves cut down trees until they wither, or gather fruits or grains until they ripen. Wine is forbidden to all Lamas. Of the three sects abovementioned, celibacy is incumbent on the Gelukpa only, but all practice it who wish to attain to superior sanctity. All Lamas fast in the

Hindoo month Flagon, (February-March,) on the 15th day of the moon. This day is called *nenas*; and the great feast of the general prayers of the Gelukpa sect in the beginning of the year may be connected with it. (Csoma de Koros' Grammar, p. 197). All good Lamas also fast twice in each month, but on these days they may eat raw fruits. The bodies of Lamas are usually burnt, and in general if not always, tombs called *dungkang* are erected over their ashes; but the bodies of priests of great holiness are sometimes cut in pieces, and dispersed on the top of a hill, or the surface of a barren plain, as food for birds; and all sects, who are admitted to be of great purity and excellence, are privileged to eat and drink out of the skulls of those whose bodies have been scattered to the winds, or they may have beads made of portions of the skulls of these good men. (Malte Brun, II, 628, quotes Rubinquis as saying, that in Tibet the people drank out of the skulls of their ancestors; this story may be an exaggeration of the present practice of the holiest Lamas.)

The doctrines and observances above-mentioned, are applicable to all orders of Lamas, so far as I have learnt. I have not fallen in with any of the Sukkias or Banboo, or Pitchoba sects, but I have always heard that the Sakkias greatly resemble the Ningmas. I will now mention some particulars of each class.

Of the Gelukpas, there are six orders: the 1st (or highest) Ghehsheh, 2d Chogzirkpa, 3d Katchin, 4th Gelong, 5th Gichul, and the 6th or lowest, Chunba. The following table shews the lower ranks or orders, and the books they read in villages and provincial establishments before attaining to each:—

Order.	Names of Books.	Subject.	Remarks.
Chunba, ..	Dohna,.. ..	Forms of prayers for procuring blessings..	Do not wear a robe, but a yellow frock, (or chola or chapkan,) a conical yellow cap without lappets, head shaved.
	Sharrah, Ningho Dukar,.. ..	On abstraction and the nothingness of this world.	

Order.	Names of Books.	Subject.	Remarks.
Gichul, ..	Saugdu, ..	Prayers to the five gods to forgive sin.	Vest red, robe or "chader" composed of two cloths, the inside one yellow, the outside one red.
	Zhjikchid, ..	On abstraction as keeping away evil and prolonging life.	
	Ganbo, ..	Forms of prayers to avert evil, procure advantages, and a general exhortation to holiness, ..	Yellow string round the waist, conical yellow cap with short lappets, heads shaved.
	Chargil, ..	Similar to the above.	
Gelong, ..	Lamo, ...	Similar in its contents to Ganbo.	*Cap*, termed Panju, conical with lappets reaching to the breast, yellow cloth or silk lappets, sometimes have *Aummani padme hom* on them. *Under dress*, red.
	Zhjaljiba,. ..	Similar in its contents to Ganbo, on observances and prohibitions. ..	*Robe.*—Consists of two sheets or robes, both yellow, the inside one called *chehgo* of woollen or serge, the outside one called *namber* of silk.
	Dua, (and sometimes) Chamshing, ...	On the necessity of submission to the will of Chamshing, i. e. God.	The Gelongs and superior ranks must always have the *chehgo* or inner robe with them, they must not sleep without it. Both robes are worn as one, right arm free, fastened over the left shoulder, head shaved.
Katchin, ..	Rangtanglú, Chaumadupelu, Gunsumlú and Zintonlú, ..	Subject not ascertained, but I understood that to become a Katchin, it was necessary to repeat the four books by heart before the Grand Lama, or the superior of one of the four monasteries near Lassa.	

To become a Gelong, it does not appear necessary that the aspirant should submit to an examination by priests chosen by the Grand Lama, or that they should have been educated at a monastery. Any Gelong can ascertain the acquirements of a person who wishes to be admitted to the rank, and if he is satisfied, the Gichul takes upon himself the dress and functions of a Gelong. This indeed may be the

practice in remote districts rather than near Lassa. Concerning the degree of learning required of a Chogzukpa, I did not inquire: there is only one of that rank in Kunawar, and I did not meet him. I am also equally ignorant of the knowledge required of a Ghehsheh, there is but one in the Chinese districts west of Mansarawar; viz. the *kanbo* or superior of the Teshigang monastery.

The names of the books given in the tabular statement, are those by which they are known in the Teshigang monastery; but the powers of the English letters only give an approximation to the pronunciation of the words. I may not be correct with regard to the contents of the books. My informants, (Gesongs,) though probably as well acquainted as others of that rank usually are in villages, with their holy books, evidently knew but little of them besides the names. I have nevertheless thought it as well to give what I learnt on the subject.

No Gelukpa should use tobacco as a Chimba; he must not take life, and as a Gichul, he must in addition not know woman; these two ranks may be considered as initiatory. A Gelong is a qualified priest, so to speak; most reach that rank, and few get above it.

Of the Ningmas and Dukpas, I procured but little information. They first learn to read and to repeat certain prayers. They then attend in a temple for three years; they never leave the place during that time, nor are allowed to speak to any one save their fellow-students and their teacher. At the end of the three years, they are qualified priests or Lamas, their dress is red. The doctrines of the two sects somewhat differ, and their great Superiors or Incarnations of Sakyamuni are different. They do not cut or shave their hair like the Gelukpas, and marriage is allowed to both sects.

The Sakkias I believe resemble the Ningmas in their doctrines, marriage is not prohibited, they wear a red dress. There are none in Kunawar; but in Pitti there is one temple belonging to them.

The Banbos are a sect of whom I could learn but little; they have no temples, that I could hear of, west of the lakes, but are said to exist in considerable numbers at Kamp, a place about a month's journey N. or N. E. of Lassa. They perform the circuit of Gangri hill and of Mansarawar lake in an opposite direction to that followed by other pilgrims. This at least in the eyes of the vulgar constitute their chief peculiarity. They apparently represent the "Bons," and the

Bonpo faith of the Tibetans before the ascendancy of Buddhism. (Csoma de Koros' Grammar, 177-178). The Sanscrit Bandya, a person entitled to reverence, is, Mr. Hodgson says, the real and significant form of the Chinese Bonze. (Lit. and Rel. p. 40, Note).

The Pitchobas, (or Pitchos and Nangbatchos, or Nangtchos,) are, I apprehend, fakirs or ascetics of different countries and religions, who frequent the great monasteries for the sake of the alms regularly distributed. I sometimes heard they were Mahometans, and sometimes people of China Proper; but *pipa* means any foreigner; *nanga*, (i. e. *nihang*, pure,) means a Hindoo or man of India equally with a Buddhist; while *tcho* is religion, and we thus have foreign religionists or holy men of India and other countries.

The Grand Lamas, or Supreme Pontiffs of the Gelukpa sect, are two in number, and reside at Lassa and Teshi Lonbo. They would seem to be of equal rank, or rather priority of incarnation decides their relative superiority, and the younger becomes the spiritual adviser of the elder. Their functions in the state are perhaps different; the one whose residence is in Lassa may be the temporal lord of the country; while the Lama of Teshi Lonbo, may be the religious superior of the sect; but this point is by no means clear to me. The Lassa Lama is termed Gheawang Rimbotcheh. Gheawa is said to be equivalent to Sakya, and Ghewang to the emanation from, or incarnation or prophet of, Sakya; but the word seems identical with the "*rgyelva*," (the victorious, or a Buddha or emanation,) of Csoma de Koros, (Gram. 148-198,) although it is not understood by the people I have met, as simply equivalent to *rgyelpo* or king. (Tib. Gram. 157.) The power of a termination, however, may be too subtle for the apprehensions of the vulgar. The people understand Rinbotcheh to be expressive of greatness, and Csoma de Koros gives it as equal to precious or holy. (Gram. 191, &c.)

The Teshi Lonbo Lama is called Panchin Rimbocheh. Panchin is no doubt, the Panchhew of Csoma de Koros, (Gram. p. 202,) and both are perhaps the Phanchajnyana, (or he of the five sorts of wisdom) of Hodgson, (Lit. and Rel. p. 40); and whether the application of the term be general or particular, it is not impossible that Presbyter or Pastor John may be a joint corruption of the same words by oriental sectaries and western travellers. The Bhootees have some notion

of the import of Pánchim Rinbotcheh, as they say it means the great one of the five jewels, but these five jewels they conceive to relate to this world only, and to be pearls and coral, gold, silver and copper!

Tesho or Teshi means goodness, and Lonbo, (or Chunpo, Tib. Gram. 198,) is a title of eminence or authority, as the Lé Lonbo or Lonpo, or Lompa, that is, the governor of Leh, (see Moorcroft, I, 334.) Ṭesho or Teshi, occurs again in Teshigang; *teshi* as before, being goodness, and *gang* equivalent to full of; and perhaps also in the Tassisudon of Turner, Teshi Lonbo is one of the four great monasteries of the Gelukpas. The three others are Dapung and Gaddan (or Galdan respectively, one and two days distant from, and Sehra close to, Lassa, (see Malte Brun. II, 625, for *sera* thence seres, &c.) but the *monastery* appears to be of recent foundation, (A. D. 1417,) Csoma de Koros' Gram. p. 187. Each of the four is ruled over by a Kanho (*Nukanpo* or principal, (Tibetan Gram. p. 198.) Our books and maps give Patala as the great monastery or temple near Lassa, and it has also been considered as the name of a sacred hill, but from the way in which it is mentioned by Purangir Gosayen, (Turner's Embassy, pp. 459, 467,) it seems clear, that the word is only equivalent to *a* monastery or *a* temple, and not that it is the name of a particular establishment or of a holy mountain, or of the residence of the Grand Lama as Csoma de Koros says it is, and further derives its name from the Patala or Tatta of the Greeks, (Gram. p. 198.)

The chief Lamas of the Ningmas, Dukpas, and Sakkias, reside at different places, and pass under different names, but the particulars I ascertained are not so satisfactory to myself as to be worth repeating.

The Gelukpas admit, that Sakya or Sakyatna, (i. e. Sakyat'hubpa, the sage Sakya,) as he is commonly called in the villages, had five principal emanations, or made five great divinities: Sharibu, Meyunghal, Rahjoo, Kung'ghas, and Phakpa Datchumba, or simply Datchumba, (Phakpa is, I believe, equivalent to Nath, in Hindi), but I could learn no particulars. The five may be the same as the creations of the Supreme Buddha, (Hodgson's Lit. and Rel. p. 40,) but from other circumstances I would infer, that among the vulgar, the five divinities mean the middle, and the four quarters, of the world, and are simply expressive of the greatness of the Supreme God.

I must again repeat, that I communicate what I have learnt with some hesitation, and I shall not be greatly surprized if my errors or misapprehensions are frequent and considerable. It is difficult to obtain a complete and accurate description even of ordinary things from the ignorant, and although I spoke with some men of good local repute, it was plain they knew nothing of the philosophy of the system they professed, or of the origin or meaning of the practices they daily followed; much of this may indeed have been my own fault as, for instance, two Lamas in the Hangrang district calculated eclipses, and although suspicious of their ability to do so, I was unable to detect them in mere plagiarism, yet they were ignorant of the lunar cycle, and had the most preposterous notions of the relative sizes and distances of the sun, moon, and planets.

It may nevertheless be gathered from what I have said, that Moorcroft does not fully discriminate between the sects, although he says there are two of them; and that Gerard, while aware of their existence, was not so careful in his enquiries as he might have been. Lama is a general appellation, and does not mean either Gelong, a monk of a particular order, or Abbot, the superior of a monastery. Lama indeed should be confined to men of reputed sanctity, and superiors seldom or never address their inferiors as Lamas, while the lower grades always apply the title to those above them. Celibacy is *not* incumbent on all Lamas, neither are all called "Gelongs," nor are they necessarily attached to a monastery. *Ani*, simply means woman; while *jamo* or *jhomo*, or *chimma*, is the proper equivalent of nun. Mr. Vigne Travels, II, 340, infers a difference between red and yellow Lamas, but Turner appears to confound the individuals of the sects, (Embassy, pp. 86, 103, 170, 242, 250 and 261,) although he tells us of the existence of the two, and of a characteristic difference in their discipline, (p. 314-15).

The Gooroo of Gerard is a Hindu term, while the Labbrang monastery, belonging to the Dukpa sect, cannot have Gelongs or Gelukpas among them. Gerard's description of the dress is not accurate; he has given what he saw on poor Lamas at their every-day work. I have seen a Lama in black.

Lamaism is perhaps extending itself in the Himalayas, and it has within the memory of the Kunawarees progressed some miles down

the Sutlej. It is now as low as Panggi near Chini; its introduction even at Sungram is still remembered; and among a people who practice Polyandrism, and who have no regular priesthood, it is more likely to extend itself than some other religions. In Kunawar there are no Brahmins, and half of the district is without other priests than the oracular ministers of the local divinities.

At p. 118, Captain Gerard says, the Lamas wear necklaces of two sorts of beads, *raksha* and *thu*, the seed of some plant, and that these necklaces contain 108 beads, which is reckoned a sacred number. There are said to be 108 sacred books of the Buddhists, containing all the knowledge which it is desirable to possess, and that the number of the beads is connected with the number of the volumes.

The number is equally important in the eyes of the Hindoos, and with them, as perhaps with the Buddhists, it is the numerical sum of the attributes of the divinity.

Raksha is most likely a corruption of *rudraksh;* at all events it is the same seed or berry, and it is brought from India. The necklace should be composed of the *rudraksh.*

The " beads" in our monkish sense, are commonly of wood, and the string may contain seven or nine, or any odd number, but I am uncertain whether this includes, as in India, the larger middle one. The Kunawaree name of this *sumram* or remembrancer is *lakchikor.*

In the annexed plate is the sentence *Aum Mani Padme Hom,* in the Ranga character, as it appears on the cap of a Gelong bought at Lassa, and also in variations of that character and in the Uchhen, disposed circularly, as I had it written by two Lamas. It will be observed, that this circular form contains the word *shi,* as well as the mystic sentence itself. The Lamas ordinarily know nothing of the import of the formulary, but say it means God, while each syllable is considered as a spell, or as efficacious in averting different kinds of evil.

Emanations—Lotchawa and Kushuk.—The Kushuk Lama presided and was seated above the other priests.—*Moorcroft,* I. 342.

The Lotchawa resides at Teshoo Loomboo, and for many years past he has appeared in Kunawar, he then appeared in Nako, and two children had the same marks by which he is said to be recognized.—*Gerard, p.* 121.

AUM MANÍ PADMÉ HÓM

with in one case the addition of Shi

in the

RANJÁ or LANTSÁ

CHARACTER.

Kashuk or Kushuk means I believe the all-knowing, and is a name usually given to pious Lamas; it may be equivalent to your holiness, in which sense however, Moorcroft hardly uses it. Lotcha has a similar meaning. One of the Lotcha, as mentioned by Gerard is commonly called Kushuk; he is the one finally decided upon as the true Lotchawa, but the other person continues to have respect paid to him by the villagers. The true Lotchawa never rose to the rank of Gelong; but he nevertheless became the reader or household priest of one of the eight *dappans*, or military commanders of Lassa; and who was engaged in the war with the Sikhs in 1841-42. Afterwards, the Lotchawa married, and in consequence lost in reality all his efficacy, although still considered as the vesture of a divinity. While I was in Hangrang, he also committed adultery; but so great is the superstition of the people, that these lapses did not greatly reduce his sanctity in *their* eyes; and I have seen strangers prostrate themselves before him, touch the earth with their foreheads, and crave his blessing, which he bestowed by putting his hand on their uncovered heads.

This same word (Kushuk) appears in Turner, (Embassy, 232-459, &c.), but it is correctly a title and not a proper name.

Religion—Deotas or Local Gods.—The temples of the deotas are magnificent and adorned with a profusion of costly ornaments. There are two or three in every village; each god has generally three distinct houses, one for himself and the third in which he is placed on grand festivals.—Gerard, p. 85-6.

Deotas, or spirits of the hills, are worshipped every where along the Sutlej. These districts fall more particularly within the sphere of my enquiries, but they are no doubt more extensively reverenced; and in the southern Himalayas, the local divinities seem to have been included by the Brahmins in their Pantheon, and changed into Devi, one of the forms of the wife of Siva. This adoption of various superstitions and deifications by an organized and ambitious priesthood has also taken place in India, (see particularly Elphinstone's Hist. I, 179;) but in a portion of Kunawar, the many and equal gods of the first inhabitants, still maintain their ancient but limited sway, not much affected by Buddhism on one side, or Brahminism on the other.

The people, however, have the idea of one great god, or rather perhaps of several divinities, to whom the deotas are subordinate; and

from the 1st to the 15th of the Hindoo month Magh, they are supposed to be absent in the upper sky, soliciting these divinities to confirm or to grant blessings. The people also talk of demons of power greater than the deotas. This system seems to correspond with the present Shamanism of Arctic Asia.

Deotas can reward and punish in this world, but not in the next, or more correctly during this life only; for in Upper Kunawar at least, they have borrowed the Buddhistic transmigration of souls.

Deotas are propitiated by sacrifices, and it is usual for the villagers collectively, to offer a goat or a sheep when the crops appear above ground. When the grain is cut, each house or family makes a similar offering. In some places, an offering is also made at this season of rejoicing on account of the birth, then or previously, of a male child. Offerings are made at any time by individuals to avert a particular evil, or procure a special blessing. The deotas themselves also occasionally desire that a sacrifice may be made through them to the greater gods, to propitiate or appease these higher powers.

The will of a deota is sought and declared by his priest or minister. Fortunate days, as for marriages, are similarly ascertained; and generally, people endeavour to learn whether they will be fortunate or not, by resorting to the priest at the temple, and receiving from him a few grains of wheat or barley. An odd number implies good fortune, an even one, the reverse.

The priest may be of any tribe of the country. In Chini in Kunawar, the present minister is a *chumar* or out-caste. The will of the deota in the selection of his priest is generally ascertained as follows: On a particular day, the period of one of the great Hindoo festivals is preferred, the majority of the villagers bathe, and putting some water only in the drinking cup of the deota, they invoke him in his temple by words and gestures. He who is chosen, is miraculously rapt, or inspired by the god; and taking up the cup he is able to distribute grain from it, (although it contained nothing but water.) The deota may also declare his pleasure in this matter, by imbuing one of his votaries with the power of thrusting unharmed and unmarked, an iron rod through some portion of his flesh. It is the custom in one village I know of to ask the deota from time to time after the death of his priest, whether he wishes a successor to be appointed. The

image is raised upon the shoulders of the people, and if the god presses heavily to the left, he wishes the election to be postponed; if he presses to the right, he wishes that it may take place without delay.

Strictly speaking, the will of the deota can only be ascertained through his priest, but an irregular election is sometimes made, and an opinion forced, as it were, from the reluctant god.

The priest gets the skin and one-fourth of the flesh of the animal sacrificed. After being chosen for the office, he does not give up his daily occupation as a husbandman or mechanic. The priesthood alone would not subsist him.

The deotas are masculine, and the people do not talk of local female divinities; yet in Lower Kunawar, a certain deota, Mansharash, has a wife named Durga, and one of the Hindoo Devis of Kunawar is his sister. The relationship and gender, however, are *Brahminical* innovations, introduced by the people of the neighbourhood doing service about the person of the Raja. The Devi in question is the one at Koti, mentioned under the head of Religion.

In two villages, Kanam and Shasso, of Upper Kunawar, a deota named Dala is worshipped. He is considered as the companion of, or as dwelling with, the Supreme God. No sacrifices are offered to him, and *Lamas* will endeavour to ascertain *his* pleasure by consulting *their* books. In another village Shalkar, of Upper Kunawar, a Lama is supposed to be possessed by a deota on certain occasions, as is related under the head of Festivals. These are instances of *Buddhism* struggling with local superstition.

In Bhotee, the term for deota is Lah. In Kunawar, the same term is used as also Sath and Shu, *i. e.* Shib. In Bhotee, the priest is termed Labdak, and in Kunawaree, Grukchu. The Kunawarees give as the Hindoostanee equivalent *ch'hernawala*, or teazer or trouble-giver.

This system of local gods may be deserving of more research. In Lah, we appear to have not only the equivalent, but the sound of the Roman *Lares*, and of the Arabian *Illah*. The deota has also some features in common with the Grecian oracle. *Lah* is evidently the root of lagang and labrang, the present Tibetan terms for a Buddhist temple, as also of *lapcha*, the only altar the Bhotees continue to raise to their ancient deities. Lah is also a term for a pass in the

mountains, which is still considered as under the care of, and as the place, of the lah or deota, or god.

Temples, &c.—There are many kinds of buildings and temples peculiar to the Lamas, the most common are tumuli, called *mane*, consisting of a dyke of loose stones, and upon their tops, are numerous pieces of slate covered with sentences in the Oochen or sacred character. *Oom mane, &c.* is the most frequent inscription. There is often a pole or two in the middle, and sometimes a flag attached to it.

Chosten or Chokten, is found in the vicinity of every Lama habitation, and on the surrounding heights. It is an enclosure formed of three walls and a roof; inside are one or more buildings of clay, shaped like urns or pyramids of different colours : yellow, light blue and white.

Douktens, are pyramids in steps, with a kind of urn above larger than the chostens ; rarely inclosed, never covered.

Labrang, is applied to two kinds of buildings, one is a square pile of stones six or eight feet high, and one and a half or two feet in diameter. They are erected in the fields to propitiate the deities for an abundant harvest. The other sort is a place of worship of various sizes.

Lagang, is a square flat-roofed house, containing a temple of Mahadeo according to the Kunawarees, but it is called Mahamoonee by the Tartars.

Lapcha—On the tops of many of the houses, are square piles of stones adorned with juniper branches, and on the road sides, are heaps of stones with poles, rags, or flags inscribed with mystic words.

Darchut.—At the corners of almost all the Tartar houses, is a pole to which a flag painted with *Oom Mané pad mee oom* is attached, with a tuft of black yak's hair above.

Cylinders, called *mane*, are common ; they are nothing more than hollow wooden barrels, inside of which are sacred sentences painted on paper or cloth ; they are always turned from the north towards the east. There is a smaller sort with a projecting piece of wood below, these are carried about by the wandering Tartars called *kawpa.*—*Gerard*, p. 123-127.

I do not know what has determined the form of the monuments called mani, and I have but little to add to Captain Gerard's descrip-

AUM MANÍ PADMÉ HÓM

(with Shi inscribed)

in the

TCHÍBEN CHARACTER

tion. From the centre of the mani, a dungten frequently rises over the ashes of a Lama. The mystic sentence, *Aum Maní padmé hóm*, occurs in varieties of the Oochen and Ranjá characters, and is sometimes disposed circularly with the word shi in the centre. I do not think that the inscriptions usually contain any thing beyond a repetition of the sentence, excepting on each declaring when and by whom the mani was made. As Captain Gerard has observed, the people are careful to leave a mani on their right hand as they pass it.

The chosten or chokten, or choksten, may be considered an altar to the glory of God. They are not always enclosed or covered, and usually consist of a pyramid surmounted by a large urn. They are of three colors: red or yellow, *lonku ;* blue or grey, *tulku ;* white, *chokú.* It will be observed, that the termination ku is the word for image. Inside the chokten, the Lamas place grain, pieces of metal, formularies or spells, and I have also noticed images in such as were ruinous. The dungkang or dungten is the tomb of a Lama or rather the monument erected over his ashes, or on the spot on which he was burnt. The Gelukpas appear to be the most regular in erecting such tombs. They place in them, formularies and three kinds of grain. They occur by themselves or arise from the centre of a mani, or from either end.—*Moorcroft, II.* 245. Such as I have seen are square and flat-topped, and always of a white colour, but *Moorcroft, II.* 367, when he infers that the "topes" of Afghanistan are tombs, does so, because they resemble the tombs of the Rajahs of Ladakh and great Lamas. What Gerard describes as a dungkang, appears to be a large uncovered chokten, but *Moorcroft* could scarcely be in error.

Labrang means simply a temple containing the image of God, and the one described as a square pile of stones by Gerard, must be a dungten, or Lama's tomb.

Lagang is of precisely the same import as Labrang; viz. the temple of the God.

The lapcha is not Buddhist, it is erected to the spirits of the hills or passes, or on the tops of the houses, and perhaps by the road side; but I do not remember any so situated, except on salient points, where the road turns and descends.—See also Turner's Embassy, p. 197-8.

The darchah is merely a flag or sign, and the word may have the same root as the Hindi dhajjá of similar import. These flags may

also have some connection with the former condition of the people, as marauders and dwellers in tents. The flag surmounted by the long hair of the horse or yak forms the usual standard, and adorns the formidable spear of the Nomade warriors of this age.

The small cylinder called mani is carried by any one thought worthy to do so by the Lamas. Captain Gerard was misinformed regarding the Rampas, (see under that head). I have heard that these cylinders are made to revolve, in order, that motion may be communicated to the contained supplications as it is supposed, and that no prayer can reach God unless an impulse be given to it by the tongue or otherwise. Mani seems to have a meaning in connection with this explanation, but the same term is applied to the fixed pile of stones; it does not seem sufficient, unless indeed it be a custom of the Lamas to beseech the Almighty by encircling the pile, and it appears that the mani at *that time* only, deserves the name.

To recapitulate the *shagri,* (see under that head,) has no connection with any religious faith.

The lapcha or lapchas is in honor of the deities of the hills.

The darchah, lagung, labrang, dungkang, chokten and mani are Buddhistic.

TEMPLES.

Shagris or Piles of Stones or Eminences.—At all the elevated piles, there are a number of square piles of stones called shughar, upon which passengers usually place a piece of quartz, or attach rags to poles which are fixed in the middle. There are also several shugars on the neighbouring heights, sacred to the deotas or spirits of the mountains. The shughars at the passes are erected by travellers, but those on the higher peaks, are commonly made at the expence of some wealthy pilgrim, not much accustomed to the mountains.—Gerard, p. 59.

In this description, two different things seem to be confounded. The shughar, (or rather shagri in Kunawaree, and toyur in Bhotee,) is built by shepherds generally, but by any one, to amuse themselves or to commemorate an exploit. They are usually placed on peaks, or on salient points.

The pile of stones with quartz, rags, &c. is termed lapchas in Kunawaree, and in Bhotee lapcha, and is afterwards referred to by Gerard at p. 126.

Monastaries—Convents.—The religious service of the Lamas, which is performed daily at the gom-pas or temples attached to monasteries.—*Moorcroft,* II, 344.

The Lamas and Gelongs who profess celibacy reside in a monastery, called ghonpa or goomba, and the nuns in a convent called chomoling.—*Gerard, p.* 119.

As Gerard states, gom-pa or gunba is the monastery, and not the temple. Labrang is the word for temple.

Chomoling simply means the nuns sides. Chomo or jomo or zhjomo being "*nun,*" and ling, "*side.*" I have not observed that the convents, so to call them, are separate buildings. Gunba comprehends I think monastery and convents; different parts of the same building being appropriated to each.

Festivals.—The grandest festival (in Kunawar) is called mentiko; it is held in the beginning of September, but I could get no account of its origin. All the people who are able to move, leave their villages and ascend the nearest hill; they proceed slowly making a circuit of several days, and this is the time of the greatest festivity; they adorn themselves with garlands and flowers, and sing and dance to the sounds of music; they run horse and foot races; perform feats of agility, feast and drink.—*Gerard, p.* 81.

In Kunawar, this festival commences on the 19th or 20th of the month Bhador, that is, as Gerard says, early in September, and it usually lasts five days. It takes place after the first crop has been gathered in, and is held in honor of the spirits of the surrounding hills, who are thanked for past blessings and propitiated for the future.

The Bhotees have a similar festival, and it is called by them namgham. It is not, however, the same as that witnessed by Mr. Trebeck. *(Moorcroft, II. 75, &c.)* If the description given by that gentleman is complete, for it was held in August, and had apparently no connection with religion.

As Buddhism has not every where, if any where, superseded the worship of the local divinities, *it* has in part yielded to the superstitions of the people; and at Shalkar, for instance, they suppose that a

certain mountain spirit is an emanation of Shakyamuni, and that he came from Lassa, some generations ago with a Lama of great sanctity. This emanation is called Durjeh Chimno, and is further supposed to be the patron of agriculture. The Lamas endeavour to turn the adoration of the people towards this hill god alone; and in imitation of the deota system, one of their number is supposed to be the chosen priest of the divinity, and on proper occasions is duly rapt or possessed. They do not, however, care to give any emanation of their supreme being a local habitation and an authority with geographical limits, and when the people proceed to a particular pass or eminence to supplicate one lord among many equals, the Lamas take no share in the ceremony.

The greatest festival of the Kunawarees is, that called sherkan by them. It is held on the 10th day of the moon in the month of Asonj, (September-October,) and corresponds with the Hindoo Dasehra.

Polyandry—Marriage.—They (the Ladakhees) have some singular domestic institutions. When an eldest son marries, the property of his father descends to him, and he is charged with the maintenance of his parents. They may continue to live with him if he and his wife please, if not he provides them with a separate dwelling. A younger son is usually made a Lama. Should there be more brothers, and they agree to the arrangement, juniors become inferior husbands to the wife of the elder. All the children, however, are considered as belonging to the head of the family. The young brothers have no authority; they wait upon the elder as his servants, and can be turned out of doors at his pleasure, without its being incumbent on him to provide for them. On the death of the eldest brother, his property, authority and widow, devolve upon his next brother.—*Moorcroft, II.* 321-2.

In this account, there are several things which I did not observe near the junction of the Sutlej and Pitti, and some of the customs are not I think reconcileable to reason or to necessity.

Polyandryism appears to be essential in a country in which the quantity of culturable land is limited, and in which pastures are not extensive; in which there are but few facilities for carrying on commerce, and in which there is no mineral wealth readily made available. This is the case in Tibet, and in many portions of the

Himalayas; and as the people are not of a warlike character, nor of a more ingenious turn of mind than neighbouring races, they have but few resources, and are almost entirely dependent on a scanty and laborious cultivation for their means of subsistence. It is therefore necessary to limit the population, and this is most simply done by allowing one wife only to each house or family. Necessity gives rise to the law, and custom renders it more binding; but a change in the circumstances of the people, produced by whatever means, may render the custom partial in its application. Thus the people of Upper Kunawar, owing to the recent demands for shawl-wool and charas, (a drug,) in India, are now engaged in a rapidly extending carrying trade; they accumulate money; and can maintain themselves in comfort in their villages by importing articles of food. Two or three brothers may thus each become rich, and seek to found a family dependent on trading enterprize, and not on agriculture, for its livelihood.

Polyandrism as I have observed it in Upper Kunawar, and in the neighbouring Bhotee districts, is not exactly the same as described by Moorcroft. The lands of a village are divided unequally among a certain number of houses, and these are assessed in a fixed sum by the state. Each house has usually one wife only, but sometimes two or three. The master or father of the family, that is, the eldest son or brother, retains the authority as long as he retains his faculties, although *his* son may have been married for sometime. On the death of the father, the eldest son, if arrived at manhood, succeeds to the mastership; but if he is a minor, the father's brother succeeds. This I should say is the *rule*, but as the civil relations of the people are not complicated, the right to the mastership has not been very strictly defined, and nephew and uncle, so to speak, act indifferently as superior; the most talented being usually put forward as the representative of the family or house.

If a woman survives her husband, she continues to live with her son; it is her right to do so, and she cannot be put away with a maintenance at his pleasure. A young brother can establish himself separately if he desires to do so; his share of the land and of the moveable property, as also his proportion of the state assessment, being determined by a sort of jury, subject to the approval of the Chief or

Government. I know instances of such a separation, but they are not numerous.

Should a wife prove barren, a second can be chosen, or should she have daughters only, a second can be chosen similarly ; custom allows three or more wives. I know of a man who took a third wife, having been disappointed of a male heir by his first and second. A man also sometimes takes a second wife with the *consent* of the first, although she may have brought him male heirs. Custom allows this, and in practice, a man will take a second or a third wife, if he is disposed to do so, against the consent of his first one; he is amenable to opinion only, and not to a well-defined law strictly administered.

Divorce takes place on the wife committing adultery, or by the mutual consent of the parties.

Chastity is not held in high esteem ; that is, the loss of it is not considered a great disgrace in the eyes of the common people. In the case of an unmarried woman, the man must support her and the child, unless he can arrange for her return to her family by the payment of a sum of money, (from five rupees or so upwards, according to circumstances.) If the woman is a nun, a similar fine is also paid to the temple to which she was attached. A man who commits adultery is fined for the benefit of the state, and he must also maintain the woman, unless he can arrange by the payment of a sum of money for her return to her husband, or to her own family.

I am not aware that the Buddhist books declare aught concerning marriage, or the social relations, and in the absence of a law, the practice of a rude people will necessarily vary.

Marriages usually take place at the age of 15 or 16 ; but one or both parties are sometimes betrothed at an earlier age. Young men and women are left to the exercise of their own choice in a greater degree than is the custom in India, but they are not absolutely free. The usual dower is generally withheld when the girl marries without the consent of her parents, custom requires that the parents of the young man should go three several times to the house of the girl's father, and offer a piece of silk and some wine; if they are accepted a first and a second time, the marriage is understood to be agreeable to the parents of the girl ; and if accepted the third time, the betrothal is complete, and is considered binding. Lamas fix an auspicious day for the mar-

riage, and on the evening previous an entertainment is given in the house of the bride; the Lamas are invited to this feast, they read certain prayers, or at least invoke a blessing on the union, and their presence is also considered necessary at the feast given by the bridegroom's parents after the ceremony.

The above is the custom among the Bhootees. Among the Kunawarees, the practice is similar, but not precisely so, and gradually approximates to that of India. In Lower Kunawar, there are neither Brahmins nor Lamas, but the priests of the spirits of the hills take their place in such ceremonies.

Polyandry—Population—Bastardy.—The women of Ladakh in consequence of their great proportionate number, find it difficult to obtain subsistence.—*Moorcroft*, II, 322.

But the mean (number of inhabitants to a house) in various parts of Kunawar gives six, which will not appear too many, since Polyandry, or a plurality of husbands, prevails.—*Gerard, p.* 3.

Besides this drawback on the increase of population, there is another peculiar to Chinese Tartary and the adjoining countries, that is celibacy, which is professed by numbers of the inhabitants.—*Gerard, p.* 3, *Note.*

Moorcroft's remark does not appear to have been made with his usual discernment. Polyandry cannot affect the proportion of males and females born, and no system of emigration on the part of the men reduces the relative numbers of the sexes. The women have no difficulty in obtaining a subsistence, for they are a robust race; they are equal to most kinds of out-door work, and the care of the fields is chiefly in their hands; socially the condition of unmarried sisters and of younger brothers is the same; both must be maintained by the head of the house, who has a right to their labor.

Family Polyandry should increase the number of souls *per house*, instead of decreasing it as Gerard observes; for besides the husband (eldest brother) and wife and their children, as in a house in Europe, there are, or may be, younger brothers and unmarried sisters; there may be uncles (so to call them) and aunts; there may be more than one wife; and finally, there may be a mother and also a step-mother.

The celibacy of one or more brothers cannot affect the population where family Polyandry is established. Every house has a wife, and

it is only when there are several brothers, that the younger ones become monks. If there is but one son, he will not, (as the rule,) become a Lama, so that the house or family is still maintained; besides which, celibacy is only *enjoined* on one out of the four orders of Lamas which prevail west of the Mansarawar Lake. I took the census of the Hangrang district of Bhotees subject to Bisseher. The total population in 1842 was 760, of whom 373 were males, and 387 were females, an excess of less than four in the hundred. Another census taken less carfully, and in which indeed I had but little reason to place confidence, gave nine more females than males.

Polyandry in spite of the seclusion of the people of the hills and a general simplicity of manners, has a marked effect in increasing bastardy. Of the 760 people of Hangrang, 26 are bastards, which is one in about 29, and as a comparatively few grown-up people only were admitted to be illegitimate, I apprehend there may be more than 26.

In 1835, the population of England and Wales was about 14,750,000, and the number of bastards affiliated, (before the New Poor Law came into operation,) was 65,475, which gives one in about 226; even if the number born should double those affiliated, the proportion would still speak strongly against Polyandry in regard to female purity. (*Wade's British History, p.* 1041 *and* 1055.) It is not clear whether the number of bastards is given for England only, or for England and Wales, but this circumstance would not greatly affect the result.

Gerard, p. 3, estimates the population of Hangrang at 1056. This was upwards of twenty years ago, and although it *may* have been somewhat greater than now, I do not believe it could differ one-third of his total, or one-half of mine.

Characters of the Kunawarees and Bhotees.—Thieves and robbers are unknown (in Kunawar,) and a person's word may be implicitly relied on in any thing regarding money matters. They have not the least distrust or suspicion. (Captain Gerard then quotes two instances, in which a few rupees were advanced to him by Kunawarees.)

The Kunawarees pride themselves on their country, and well know how superior they are to the other mountaineers.—*Gerard, p.* 76-77. I did not like them (the Bhotees) so well at first as the Kunawarees, but they improved on further acquaintance with them

and their language, and I now think them by far the finest race of people in the hills, and much superior to the inhabitants of the plains of India.—*Gerard, p.* 102.

Cheating, lying, and thieving are unknown; they have the nicest notions of honesty of any people in the world.—*Gerard, p.* 106, *see also p.* 108.

That Captain Gerard was not himself robbed, and that his good faith was trusted is not surprising; he was an officer of known rank and position; he was accompanied by agents on the part of the Raja, and a courteous and wealthy stranger is usually welcome among a secluded agricultural people, but had he made more careful inquiries than he seems to have done, he would have found that the Kunawarees can lie, cheat, steal, and commit murder. During the last 15 or 18 years, two men of Kunawar (of proscribed races indeed, *lohars* and *chumars*,) have been hanged, and Kunawarees Proper are almost monthly punished for different crimes by the loss of a hand, or in a less severe manner. Similar remarks apply to the Bhotees. A Bhotee boy very dexterously carried off a powder flask of mine, and half of my servants as well as a more respectable man, the Lahore Vakeel with me, had a mixed metal palmed off upon them as pure gold by various Bhotees. In this metal there was some gold, which was obtained by stealing the books in monasteries and temples, and then burning them for the sake of the gold leaf used in "illuminating" the margins, &c.— *See also Captain Hutton's Tour, III,* 2.—*Jour. As. Soc.*

The Bhotees and Kunawarees have some of the usual virtues of other secluded races, but their evil passions are latent, and only want development. The Bhotees are I think a people without the spirits of men, and like other cowards they are cruel. Still I don't think them beyond redemption, and if their country continues distracted, their energies may be roused. Of the Kunawarees I have a higher opinion. They have some pride of race, due perhaps to their Indian origin, and they have also some intelligence and enterprize, which have latterly been turned towards trade, and a few men in Upper Kunawar are possessed of some wealth.

This trade received a considerable impulse on the emigration of many thousand Cashmere weavers to the plains about 1818 and 1820, and by the late increasing demand in the plains for the *charas* of

Yarkand. The Kunawarees gradually became large carriers of shawl-wool, and of the drug in question; but want of capital obliged many to borrow money, and want of experience in such affairs, with a general ignorance of the world, rendered them no match for the Hindoo *mahajans* of Rampur, and the Cashmeree dealers of Leh, and most of them have in consequence run into debt. Latterly, they have become direct purchasers from the Government farmers and the Yarkand traders, and are emancipating themselves by degrees, while some have realized fortunes so to speak.

This increase of trade has had one bad effect: the profits induced *every one* to become buyers and sellers, and while the better sort borrowed hundreds in Rampur, they lent tens to their poor village neighbours on the mortgage of the produce of their lands. Every village in Upper Kunawar is in debt, and its crops belong as fully to a few monied men as the harvest of India belongs to the bankers of *its* towns.

What Captain Gerard observes at p. 108, regarding the hospitality and liberality of the Tartars, he might have found occasion to alter, had he lived longer among them. He was then at Shipke, a Chinese village, and the people were desirous that he should get into the British territory again as speedily as possible. It is besides the custom to supply the ordinary wants of great men when travelling, that is, to bring a *nazzur* of gram, a sheep, &c. levied by force from the villagers by the local authority. After the first novelty of his appearance or visit had worn off, he would have found, that they could use short weights, adulterate flour, and drive hard bargains in every sense of the word.

In making these remarks, I would not have it inferred, that I consider the Kunawarees and the Tartars as essentially dishonest, or as usually grasping, but simply as not deserving the great commendation bestowed on them.

Employment of the Kunawarees.—The Kunawarees are all traders, and their chief riches consist in large flocks of sheep and goats. In November, many come to Rampur with wool, and a few go to the plains to purchase merchandize for the markets of Garo and Leh, and they likewise visit the fair at Hurdwar; most of them go to Leh or Garoo. In the summer months, the people who stay at home look after their vineyards, and attend to their flocks; the shepherds live in small

houses called *dogree* or *shumung*, where they employ themselves in making butter.—*Gerard, p.* 79-80.

The Kunawarees are rather all agriculturists than all traders, and a strict Polyandry at once implies, that the people have a limited supply of food at home, and scarcely any from abroad. The people of *Lower* Kunawar are not traders in the sense meant by Gerard; even now very few of them go to Garoo and Leh, and their traffic consists in exchanging woollens and fruits, or gram and butter. The flocks of sheep and goats do not furnish much, if any, butter, and the greater portion of that article, used in southern Tibet, is taken across the hills viâ Rampur and other places.

A mere sheep-fold is called *shirnang*, but where a little cultivation is attached to it, the term is *dogree*.

Trade of Kunawar.—Almost all the trade (of Kunawar) is conducted by barter.—*Gerard, p.* 181.

This was more particularly the case when Gerard wrote than at present. The increasing trade in shawl-wool and *charas* render the export of coin necessary, but it is probable that while the opium trade lasted, the value of exports and imports was nearly the same.

The trade in *charas* has arisen, and that in shawl-wool has greatly increased, within the last few years.

The accompanying table will give some information regarding the exports from Tibet to Rampur.

Tabular Statement of the Export Trade of Tibet to Rampur on the Sutlej, during the year 1837-41, *both inclusive.*

Pashm or Shawl Wool.						Wool.			Borax, (crude.)			Charas.			Miscellaneous.	Total Value.	Remarks.
White.			Black.														
Quantity.	Rate.	Value in Rupees.	Quantity.	Rate.	Value in Rupees.	Quantity.	Rate.	Value in Rupees.	Quantity.	Rate.	Value in Rupees.	Quantity.	Rate.	Value in Rupees.	Estimated value in Rupees.	Rupees.	
Kacha mds. of 16 seers Pakka each.			Kacha mds. of 16 seers Pakka each.			Kacha mds. of 16 seers Pakka each.			Kacha mds. of 16 seers Pakka each.			Kacha mds. of 16 seers Pakka each.					
1185	3½ Rs. per Batti or 2 seers Pakka.	33180	175	1⅓ Rs. per Batti or 2 seers Pakka.	2450	1092	8 seers Kacha per Rupee.	5460	394	13¼ seers Kacha per Rupee.	1189	215	6¼ Rs. per Batti or 2 srs. Pakka.	10750	2500	55529	Of the miscellaneous articles no detailed statements have been furnished and are not perhaps procurable. They include Ponies, prob. value 500 Rs. Pashmina, coarse, 325 ,, Woollens, coarse, 400 ,, Silks, China, 250 ,, Tea, ... 350 ,, Salt, ... 200 ,, Gold, ... 350 ,, Chowries, .. 100 ,, to which may be added zedoary, coarse Russia leather, sulphur, coral, felts, orpiment, and badian khatai, (an aromatic,) but in small quantities. Only a few moreover of the miscellaneous articles are regularly brought for sale and all in variable quantities. A large quantity of salt, and a considerable number of sheep and goats are annually sold in Rampur; but the salt is procured, and the sheep and goats are bred, in the hills of the Punjab.
1481	4 do.	47392	190	2 do.	3040	784	8 srs. do.	3920	566	16 seers ditto,	1415	236	4½ do.	8496	2500	66763	
1463	6 do	70224	119	3 do.	2856	787	8 srs. do.	3935	678	15 seers ditto,	1808	241	5¼ do.	10122	2500	91445	
1400	8 do.	89600	151	4 do	4832	1570	7 srs. do.	8971	505	13 srs. 6 cks. do.	1510	57	5¼ do.	2394	2500	109807	
200	10½ do.	16800	23	5¼ do.	966	58	6 srs. do.	387	22	13 srs. 6 cks. do.	66	16	7⅛ do.	960	500	19679	

Charas, coarse Russia leather, coral, felts, badian khatai, and an inferior pashm of short staple, are brought from Yarkand.
The best pashm wool, woollens, ponies, gold, salt, orpiment and nearly all the borax from the Chinese districts of Garo and Rohtak.
Inferior pashm, some borax, sulphur, and coarse pashminas from Ladakh.
Tea and silks from Lassa.
Zedoary from Nepal; and chowries from Tibet generally.

REVENUES OF PITTI.

Statistics of a Bhotee Village.—The whole revenue of Pitti is collected in grain, by a measure called *khal*, equal to eight pakka seers, and of the value of thirteen annas. The revenue is levied upon but 267 houses, the total will be 2,937 *khals*, or in value 2,386 rupees.—*Moorcroft, II*, p. 70-71.

"Estimated" should perhaps have been used by Mr. Trebeck instead of "*collected*," see also *Gerard p.* 147. In 1841-42, there were in Pitti about 250 *paying* houses, and of that number, the revenues of fifty-two or fifty-three were appropriated to the five monasteries of the district, agreeably to an arrangement made by Lassa on the transfer of Pitti to Ladakh, (see *Chanthan*, history of.) The sum demanded from the 197 or 198 houses was 398 rupees, and about 30 pieces of woollen. This tax is denominated *mattal;* besides the above, the Rajah of Ladakh levied from all Pitti a tax named *Hortal*, and a second *mattal*, amounting to 36 and 18 rupees respectively. *Hortal* means the tax of *Hor*, the country about Yarkand. *Mattal* means the real or principal or original tax. *Mah* being the same as *mul* in Hindee. I am unable to explain the application of the term to the small tax of rupees 18.

The Rajah of Ladakh further demands a quantity of iron, cotton goods, paper, madder, &c. from the whole of the district, for which he gives 50 rupees, taking however 200 rupees' worth of goods.

Besides the revenues appropriated to the monasteries, the division of Pitti, called Pin, pays to the Abbot of Teshingang on the Indus, a quantity of grain. The Abbot also sends a quantity of tea to the houses or families of the valley, for which he asks and gets double price. Teshigang belongs to the Chinese.

This same division Pin, pays to Bisséhir, a British dependency, 32 pieces of woollen and one sheep; the sheep and two of the pieces of cloth being the perquisite of the Bisséhir authorities sent to collect the tax.

Kulu, (a Lahore dependency,) demands from the whole of Pitti including the houses attached to monasteries, one *ju* or *jao* of gold, equal to 8 or 9 rupees, and also 4 pieces of woollen.

As my statement of the revenues differs greatly from the estimate of Mr. Trebeck, I may be wrong; that is, my informants may have purposely misled me. From what I have seen however of these parts, I incline to the smaller sums as the more probable one. In Pitti and the adjoining districts, I would say that eight seers of wheat are now worth eight annas, instead of thirteen, and that eight seers of barley are worth five or six annas only.

The various claims on the people of Pitti are a good specimen of the complicated relations of the different districts along the Snowy Range, notwithstanding the approximation of the large and consolidated empires of England and China.

I annex a table exhibiting the number of people, and the agricultural means of Changgo on the Pitti river; together with some other particulars which may be curious, if not of much value. Changgo produces somewhat more grain than it consumes, and several of its inhabitants are traders. The village is in Hangrang, the Bhotee district subject to Bisséhir.

With reference to the Hangrang district, I may here say, that instead of five spots, and some narrow strips capable of cultivation, as Gerard says, p. 15, there are seven separate villages, one temple with lands attached, and at least three detached pieces of land belonging to one or other of the villages.

Statistics of Chánggo in Hangrang on the Pittí River, a Bhotee district subject to Bisséhir.

Houses which pay Revenue.	No. of Houses.	Males above 12.	Females ditto.	Males under 12.	Females ditto.	Man Servant.	Maid ditto.	Bullocks.	Zhos, male hybrids.	Yaks.	Cows.	Zomos, female hybrids.	Sheep and Goats.	Ploughs' of Land.	Asses.	Ploughs' of Land.	Remarks.
	1	1	2	2	1	1	0	0	0	0	1	0	0	0	0	2½	*Annual Demands of Government.*
	2	3	1	1	1	0	1	0	0	0	1	0	3	0	0	2½	
	3	3	1	1	3	1	1	0	1	1	1	0	15	1	0	4	Rupees, ... 35
	4	2	3	2	0	0	0	0	0	1	1	0	4	0	0	2	Karraktis, coarse woollens, ... } 144 hats
	5	2	2	0	0	0	1	1	0	1	2	0	5	0	0	3	
	6	3	1	1	2	0	1	1	1	1	1	0	13	1	0	2	Pakkis-fine woollens, ... } 1 piece
	7	2	1	1	1	0	1	1	2	0	2	0	4	0	0	1½	
	8	3	2	1	3	1	6	2	3	2	3	1	21	3	3	7	*Productions of the Village. Fruits.*—Apricots.
	9	1	1	3	1	1	1	1	1	1	3	0	14	1	1	3	
	10	2	1	3	2	0	0	0	1	0	1	0	8	0	0	2	*Vegetables.*—Turnips, Onions.
	11	1	1	0	0	0	1	0	1	2	2	0	15	0	0	3½	
	12	2	1	0	0	0	1	1	1	0	2	0	3	0	0	2½	*Principal Grains, &c.*—Wheat, barley, jammar, and lona (kinds of barley) chineh, chastang(beans,) dao or fabra, and perhaps occasionally some others.
	13	3	2	1	0	0	1	1	0	0	2	0	4	0	0	3	
	14	2	1	0	0	1	1	1	1	0	2	0	11	0	0	3	
	15	2	1	0	3	0	0	1	2	0	2	0	12	0	0	3½	
	16	2	2	2	0	0	1	0	0	0	1	0	3	0	0	3½	
		34	23	18	17	5	17	10	14	9	27	1	135	6	4	48½	*Note.*—A few stalks of oats, *péá*, in Kunawaree, and *Kassam* in Bhotee, are found in every field, but the grain is nowhere cultivated.
Non-paying Houses.	1	2	2	0	1	0	0										Illegitimate,..... 7
	2	2	2	2	1	0	0										4 Males, ... { 1 Man. 3 Boys.
	3	1	2	0	0	0	0										3 Females, ... Girls.
	4	1	1	1	0	0	0										
Lohar	1	2	2	0	1	0	0										Lamas, ... 16 } Ningmas, Nuns, (none,) } a red sect.
Grand Total.	42 137 Souls. 68 Males, 69 Fems.				20	5	17	10	14	9	27	1	135	6	4	48½	

Pitti Authorities.

The house belonged to the *taoche*, or head of the carriers, and he with Khaza Khan, the manager of the district, and the *paon* or scribe, paid me every civility in the absence of the chief of Pitti, Sultan Beg, whom I had left at Leh.—*Moorcroft, II.* 60.

The *taoche,* or *togotcheh,* or *dogotcheh,* is simply the deputy of the resident manager of the Pitti district; he is however particularly charged with the collection of the revenue under the *karrpan* or *griot,* chief or manager; and he also collects the porters and beasts of burden for the use of the Rajah, and proceeds in person with them if many are required.

Khaza Khan was the father of the present *karrpan,* or manager of Pitti; he was a Buddhist and not a Mahometan as might be supposed, if we looked upon Khan with our Indian experience only; his real name was Teshi (or Tashi) Dandup.

Paon is not known as the word for scribe in Pitti or its neighbourhood, but the individual alluded to by Mr. Trebeck, is still remembered as a skilful carver, &c. He was the eldest son of Khaza Khan, above-mentioned. The Bhotee for scribe is *dunghi.*

Sultan Begh was of a family of Shia Mahometans settled near Leh; his grand-daughter or great-grand-daughter married Gholam Khan, subsequently made chief of Pitti, an active partisan of the Sikhs; and who was put to death by the Chinese after their victory in December 1841, near the Mansarawar Lake.

Food.—All classes of Tibetans eat three meals a day: the first consists of tea; the second of tea or of meal porridge, if that cannot be afforded; the third of meat, rice, vegetables and bread by the upper, and soup porridge and bread by the lower classes. The Tibetans never drink plain water if they can afford it; the poorer drink a beverage called *chang.*—*Moorcroft, II,* 328-331.

The food of the people (of Kunawar) is bannocks of different kinds of grain, kitchen vegetables, and a great proportion of meat; their most usual drink is tea, and they occasionally take a dram of spirituous liquor, and at their festivals they indulge pretty freely.—*Gerard, p.* 77.

The food of the people, (*i. e.* of the Hangrang Bhotees,) is almost wholly flesh, for even a part of the little grain produced is exported, and most of the rest made into an intoxicating liquor named *chong.* They take their dram of spirits in the cold mornings.—*Gerard, p.* 113-114. Flesh of all kinds forms the principal part of the food of the Ladakhees.—*Gerard, p.* 154.

I think the above observations are applicable only to the better classes, and not to the poor people; that is, to nearly all the people.

Indeed a family of the better sort in Kunawar will only kill a sheep or a goat once in a month. In the adjoining Bhotee districts, the people may do so once in 18 or 20 days, their flocks being larger and more easily fed. Tea is not regularly drunk by more than ten families in all Kunawar; some drink it occasionally, some rarely, and some perhaps never. *Chong* is drunk by the poor people on particular occasions only; but there are dissipated people every where, and some men may take a dram every morning. Grain is too valuable to admit of its consumption in the manufacture of spirits.

I think that the poorer people in Upper Kunawar and in Tibet, live chiefly on the meal of parched grain mixed with water. They don't often or regularly bake cakes, although those in better circumstances may frequently do so. In times of scarcity, they eat chestnuts in Lower Kunawar, and in Upper Kunawar and the adjoining districts, they use apricot kernels; that is, if they have them, for apricots do not bear at a greater elevation than 10,500 feet.

Drink of the Kunawarees—Sore Eyes.—For although the Kunawarees can get nothing but snow for some months in the year, they are not so subject to *goitre* as the people that live in the damp grounds. In winter, the eyes are frequently inflamed by the reflection of the snow, and the people travelling at this time, protect them with large leaves, generally of the rhubarb.—*Gerard, p.* 82.

It may be safely said, that the Kunawarees are never reduced to drink snow water for more than a few days in a year, and a few small villages only are necessitated to do that; every village is near a stream or spring, and both streams and springs flow in winter, notwithstanding snow and frost.

The rhubarb is not green in winter, and if it had leaves at that season, they could not easily be got at; being buried at great heights under snow. Hair spectacles, juniper twigs, &c. are used to protect the eyes.

Customs as to Food.—The present did not include some hares, for no other reason as far as I could learn, than that the length of their ears assimilated them to asses.—*Moorcroft, I,* 424-5.

The Bhotees do not eat hares, nor birds of any kind, nor fish. Towards our borders, however, they are somewhat lax; but towards Rohtak, our hill traders are good humouredly reviled, when they eat the fish of the lakes of that neighbourhood.

I did not learn the origin of these customs, but they may be the result of an effort of Buddhism, to spare life in whatever shape it appears.

Scarcity of Grain—The Potatoe.—The crops (in Kunawar) for the most part are poor, and a great want of grain pervades the whole country. In times of scarcity, horse chestnuts, after being steeped for two or three days to take away their bitterness, are dried and ground into flour, and apricots and walnuts also form part of the food of the people.—*Gerard, p.* 64-5.

I have seen wheat flour as cheap as sixty pounds for a rupee, but the average price in Kunawar is from thirty to forty, and in October and November, it is scarcely to be procured for any money.—*Gerard, p.* 65.

Kunawar has a few villages which produce more grain than their inhabitants require, but considered as a whole, the district imports a portion of its food. The people never willingly part with their grain, and during my residence in Upper Kunawar and the adjacent Bhotee districts, I got it compulsorily at the rate of $8\frac{1}{2}$ and 10 seers, (17 and 20 lbs.) the rupee, and what I required for the few people with me, was sometimes brought from a distance of 60 miles.

Scarcities are occasioned by a want of rain in April, but sometimes by a destructive insect which eats the stalk. I heard also that about 25 years ago, (1817-18,) a flight of locusts appeared. The kernels of apricot stones, treated the same way as Gerard says of horse chestnuts, are likewise used to economize grain, and the people dig up roots, and make use of the wild pea named *charek*, which I have met with in Hangrang.

Gerard laments (p. 65,) that the potatoe was not so extensive by cultivated as it ought to be, considering that his brother had at different times distributed upwards of 2,000 lbs. weight of that vegetable among the people. It is now scarcely if at all cultivated, and the reason may be simple; as a first crop, it is not so productive as gram, and as a second it cannot perhaps be matured.

Tea.—The next article of importance in the trade of Ladakh, is tea brought in square masses or lumps, packed (in Lassa) in the raw skins of yaks, the hair inwards. Each block called *dom* by the Kashmiris, and Ponkah by the Lassans, weighs about 4 Delhi seers, less

than 8 lbs. avoirdupois; the green sold wholesale at three rupees per seer, and the black at less than two rupees, and the retail price is nearly double.—*Moorcroft, II,* 350-1.

There are three kinds of tea brought from Lassa, called severally *zangcha, chungchu and kopinjeh.* The former two may be called black teas, the *kopinjeh* green. At the Garo fair, a block of the black may be bought for six rupees, and of the green for 18 rupees.—*See also Mr. Vigne's Travels, II,* 345.

Chadam is the name given to the block in Ladakh; and about Garo, *parka* is I heard the Lassan name, and *ponkah* may be a misprint.

Chabbas—Tea Merchants.—In the course of October, a caravan of *chabbas,* as they are called, traders from Lassa, arrived with many yaks laden with tea.—*Moorcroft, II,* 252.

Chabbas means literally tea-ees, *i. e.* tea merchants, *cha* or *zhja* being the Bhotee for tea. The caravan arrives annually from Lassa, returning however the next year; and the investment is chiefly the property of the principal men in the place, *i. e.* in this case of the public authorities. An officer of the Government, called *jung-chung,* comes in charge of the caravan. I have heard that about a lac and a half of rupees worth, Leh price, was formerly required annually for the Cashmir market, but that of late, the Sikh authorities in Ladakh, in emulation of the functionaries of Lassa, monopolized the trade; so as in the first instance, to diminish the consumption of the article, and afterwards the value of the trade in it.

Bisséhir Tea.—It appeared that a considerable importation of a vegetable product used as tea, took place from the British dependency of Bisahar. According to information obtained from two intelligent natives of that province, the tea of Bisahar is of two kinds, green and black. The green grows in greatest abundance about Jaghul, between Rampur and Sarai, (Sarahan).—*Moorcroft, II,* 352.

I understand that the Bisahar tea was produced chiefly about Lippa, that of Jukhul being a greenish variety. The tea or bush is called *pangcha.* The leaves are exposed in the sun for two days. They are then mixed with a gum called *changta* or *jatta,* which oozes from a tree called *trin* found near Lippa. This, it is said, is done to give it a colour. The bark of a tree called *sangcha,* (found about Rampur,) is used instead of cinnamon.

The Bissehir tea is drank by those who cannot procure Chinese tea, or it is mixed with the superior kind. At Garo when Chinese tea is scarce, that of Bissehir will sell for three seers *katcha* (or 2 lbs. good) the Rupee.

Bissehir Cups.—Each man has his own cup, either of China porcelain, or which is more common, made out of the knot of the horse chestnut, edged or lined with silver, or plain. About five thousand of these are annually exported from Bissehir to Gardokh, and sold at the rate of six for the rupee.—*Moorcroft, I,* 329-30.

Inferior cups only are made of the chestnut; they are also made of the apricot tree and of other woods, but the best kinds are made of the knot or excrescence of a tree called in Kunawar, *kauzal,* and about Rampur, *láör.* The cup itself is called *puriveh.*—*Gerard, p.* 1812, calls the vessels *porwa,* and says, they are made of juniper wood, but on this point he is certainly mistaken, if he means that they are made of the juniper only.

Pashm Tus.—Although the fleece of the sheep affords a material similar to that of the goat, it is not in sufficient proportion, nor of adequate length, to be considered fit for the manufacture of shawls. Besides the fleece of the domesticated goat, that of the wild goat under the denomination of *asali tus* is exported in smaller quantities to Kashmir.—*Moorcroft, I,* 348-9.

The dogs are of a large ferocious breed; they are covered with black wool.—*Gerard, p.* 73.

Of the shawl-wool of the sheep I could never learn, or at least learn of it as an article of trade. It may exist in nature, and yet I apprehend that such animals only as have coats of hair are provided with an under-coating of what deserves to be called shawl-wool.—Thus the dogs of Tibet which are covered with black hair, and not wool as Gerard perhaps inadvertently says, have an under-coating of inferior shawl-wool.

Asali tus is a Kashmiree, *i. e.* Persian or rather Arabic, expression, for the wool of the wild goat. *Tusi* means simply a kind of brown color. In the Punjab *tusi* is applied to any kind of broad cloths retaining the natural color of the wool, which may be called *tus. Pat* is the term given to the wool of the goats of Afghanistan and Turkistan, and the cloth made from it is called *pattu;* similarly, *barak* is

the name given to the cloth made of the wool of the camel of Central Asia.

The cloth made of the wool of wild goat of Tibet, which I have seen, had always a strong smell.

Gold.—The province (Chanthan) also produces gold in considerable quantities, but the search after it is discouraged by local superstition, and by the Chinese authorities.—*Moorcroft, II,* 364.

The search for gold seems to be discouraged by a tax only, for the local superstition simply says, that pieces of extraordinary size belong to the genii of the spot, and should not be removed. The gold is found deep in the ground, and the well-sinkers all come from Lassa, and are employed chiefly by merchants of that place. The tax on each pit or well, or party of diggers, is a *sirrjao* or *jao* of gold, the *jao* weighing about $7\frac{1}{2}$ mashas, and being worth about 8 rupees on the spot, and about 9 rupees in Rampur.

The tax is collected by a special authority named the *sirrpan,* or gold manager.

Sirr appears to be the term for gold throughout Central Asia and in Tibet; as in Persia it is the root of the term for yellow.

Natural Tinder.—At first I used a flint and match paper, but I afterwards exchanged it for the flower of a plant that grows near the snow.—*Gerard, p.* 110.

The plant is called *bachow-chi,* that is bachow-grass. It grows at low levels as well as near the snow. The tinder is called *bacha* in Kunawar, and *kufri* towards Rampur, and is the leaf not the flower of the plant. There are three plants similar in kind which produce this tinder.

Animals—Wool—Hybrids.—There are some white bears, and hogs, hares, and deer of many sorts are plentiful; there is one species of deer called *sar* that seems to be the wild goat. There are animals about the size of a dog called *chungkoo* and *mangsa,* the former are white, the latter are red. The common and musk deer.—*Gerard, p.* 74.

The birds are pheasants, hawks, eagles, crows, kites, pigeons, and *chukors.* The most beautiful bird I have seen in the hills is named *peeara,* the natives call it the king of the birds. Fish are not abundant, and I have seen only one kind.—*Gerard, p.* 75.

I never saw the bears mentioned by Gerard, but I have usually heard them described as of a reddish colour, with a white crescent on the breast. The ordinary deer, the musk deer, and that termed *sar*, are not found in Upper Kunawar. *Chanku* is the Bhotee, and *mangsa* the Kunawaree term for the wild dog; the animals are therefore one and the same, (*see also Captain Hutton, II*, 16, *Jour. As. Soc.*) In Upper Kunawar, they are said to be of a brownish or reddish color, and are but seldom seen. They are considered as coming from the neighbourhood of the Indus, and it is natural that their chief haunts should lie near the large flocks of sheep and goats kept between Garo and Rohtak.

The ordinary wild animals in Upper Kunawar are the hare, the jackall, (and perhaps the fox,) the wild sheep, (*war* male, and *namo* female,) the wild goat or ibex, (*kin* male, and *danmo* female,) the leopard and the leopard-cat. The wild sheep subsists chiefly on grass, and the wild goat as much as it can on the leaves and tender branches of trees and shrubs; it prefers the mountain ash. Of the wild goats there are not many, and they are difficult to get at with a gun. The wild sheep is more accessible. The bear is not to be found beyond the limits of the forest, but the grapes of the villages near the junction of the Sutlej and Pitti, attract it towards the fall of the year. A few others are to be met with in some of the ravines. I have not noticed the rat alluded to by Gerard, but its existence in particular localities has been also well ascertained by others. The wild ass ranges about the Churnoril lake, and towards the sources of the Sutlej.

The gigantic *chakor* is frequently met with in Upper Kunawar, but it keeps close to the snow. The ordinary *chakors* are found in great numbers, but they retreat to the heights during the breeding season. During the harvest, pigeons appear from the southward, but a few of a particular kind with light plumage remain throughout the year. The common dove of India, and a small sparrow appear in the summer, and also a few eagles; but crows of different kinds and several varieties of small birds are more numerous about the villages in the winter than at another period.

In Upper Kunawar, large fish are only to be met with in the Sutlej, considerably below its junction with the Pitti. A few of the size of minnows may be found in pools, and perhaps in the smaller streams.

The ordinary domestic animals are ponies, asses, a few mules, ordinary hill bulls, yaks, sheep, and goats. To these may be added dogs and cats. The ponies are small but hardy; a better kind comes from the valley of the Indus, and a better still from beyond the Karakorum range. The asses are small. The yaks are as numerous as the common black cattle of the lower hills, but they are chiefly imported; and the most valuable animals for draught and dairy produce are the male and female hybrids of the yak and cow. There is nothing peculiar to a casual observer in the ordinary sheep and goats; but the sheep of the highlands near the Indus on either side is not uncommon, and is famous for its long silky wool. The Government agency (about 1820) failed, however, to bring this wool to Kotghar, (six marches above Simlah,) at such a price as to render it a profitable export to England. For this there may be two reasons: 1st, the dirty state of the wool; and 2nd, the very large prices necessarily given, by suddenly increasing *ad libitum*, the demand for the article. Captain Gerard himself confirms this, when he says, (p. 19,) the Kunawarees found it more profitable to take their wool to Rampur (or Kotghar) than to Gurhwal, *see also Captain Hutton's Tour, II,* 12, *Journal Asiatic Society.* The *pashm* of the goat of this quarter (Hangrang, &c.) is short and inferior. The dogs are of the kind known as the Tibet mastiff, but somewhat smaller. The cat does not appear to differ from the domestic animal of India.

I annex a statement of the hybrids common in Upper Kunawar and the adjacent Bhotee districts:—

Yak—Cow.		Bull—Zomo.		Yak—Zomo.	
Zho (male), *Superior for carriage.*	Zomo (female.) *Milk better and more abundant than that of the common Cow.*	Trolpo, (male.) *Good for carriage, but slow.*	Trolmeh, (female.) *Milk equal to that of the common Cow.*	Gano. (male.)	Gareh. (female.)
		Bull—Trolmeh.		*Die in a year or two. I add this as indirectly corroborative of the incapacity of Hybrids to continue their mixed race.*	
			Produce scarcely distinguishable from that of the common Bull and Cow.		

The female of the yak is called *brimo* in Kunawaree, and *dimo* in Bhotee. It is not used for hybrid produce, and as it is said not to live in Upper Kunawar, very few are to be seen.

Yarkand Ass.—Yarkand Mare.	*Hill Ass.—Hill Mare.*
Ghëáreh.	Deh.
Bring from 160 to 200 Rs. in Garo.	Worth about 50 Rs. in Garo.

The female in either case superior to the male.

The mules are chiefly purchased by the Lassa traders. It is not considered proper by the Tibetans of Lassa to breed mules, and if by chance one is born among their herds, some purifying ceremonies are gone through by the owner.

The subjoined table shows the ordinary price of animals of a fair quality in Upper Kunawar, together with the loads they usually carry:—

Animals.	*Price.*	*Load.*
Ram, ...	3 0	16 to 20lbs.
He-Goat, ...	4 5	16 to 20lbs.
Ass,....	10 16	64lbs.
Mule, ...	50 80	128lbs.
Poney, ...	50 60	128lbs.
Zho, ...	16 17	128lbs.

A man carries 64lbs. as a fair average burden.

Wild Animals—The Ass.—In these elevated regions wild horses, *keang*; asses, *goorkhar*; and yaks, *dong*; besides innumerable hares and deer, are plentiful.—*Gerard, p.* 117.

The *keang* is, I think, the only animal of the kind found along the Upper Indus, or indeed in Tibet generally, and it is an ass, not a horse. *Turner* (204-5) and *Moorcroft*, (*II*, 295 *and* 443,) evidently saw but one animal, notwithstanding the different designations used by the latter in his account of his journey in 1812. The descriptions given by Moorcroft seem to be accurate, excepting that the tail is terminated by a tuft of long hair, and that there is one stripe only along the back, and none across the shoulders. I procured two skins of the *keang*, and sent them to Dr. Jameson, Officiating Superintendent of the Botanical Gardens at Seharanpore.

There are wild yaks north and east of Garo, but none in the districts visited by Captain Gerard, and I doubt the existence of deer, properly so called, and of the numbers innumerable of wild goats and sheep, which do however exist in small herds in these parts.

To be continued.

Proceedings of the Asiatic Society.—March, 1844.

(*Wednesday Evening, the 6th March*, 1844.)

The usual Monthly Meeting was held on Wednesday evening, the 6th instant, at 8½ P. M. The Honorable Sir H. W. Seton in the chair.

Lieutenant Hopkinson, B. N. I., Junior Assistant to the Commissioner of Arracan, was duly elected a Member of the Society, and the usual notification was ordered to be made to him.

The following new Members were proposed; viz.

B. Colvin, Esq., B. C. S., proposed by E. C. Ravenshaw, Esq. C. S., and seconded by the Secretary.

W. Quintin, Esq. C. S., proposed by E. C. Ravenshaw, Esq. C. S., and seconded by the Sub-Secretary.

Read the following letter from Lady Rodd, accompanying the *Eloge* to which it refers:—

To the President and Members of the Asiatic Society, Calcutta.

Lady Rodd has had the pleasure of receiving a very gratifying letter from the President and Members of the Asiatic Society; in consequence of the flattering manner in which the Medallion of her revered father has been received, her Ladyship begs to offer a copy of the *Eloge* lately passed on Major Rennell by the Institute at Paris, who were so well able to appreciate the value of that celebrated man. Lady Rodd wishes to offer her sincere thanks to the President and Members of the Asiatic Society for their kindness in placing the Medallion in so honorable a position.

Wimpole Street, 27th December, 1843.

Read the following letter from B. H. Hodgson, Esq., late Resident at Kathmandoo:—

H. Torrens, *Esq. Vice-President, Asiatic Society.*

On board the Hardwicke, Saugor, Feb. 9, 1844.

Sir,—I request you will be pleased to convey to the President and Members of this Society my heartfelt regret that, never having before addressed a public body,

and being wholly unprepared for the honour and kindness lavished on me at the special meeting of Tuesday last, I found myself quite unable to do justice to those sentiments of pride and pleasure with which the Hon'ble the President's proposal, and the cordial reception it met with from the meeting, inspired me.

I cannot now hope to recover the lost opportunity of expressing my sentiments, but lest I should possibly seem wanting in a due sense of the distinction proposed to be conferred upon me, I beg leave to say, that every circumstance of the meeting of Tuesday last, is engraved upon my heart; that I contemplate the idea of my bust being placed in the Society's Hall as a proof of the regard and esteem of those who have known me so long, with inexpressible delight; and that so long as I live, the welfare of the Society will ever be the objects of my warmest wishes, and so far as may be, of my best endeavours.

I have the honor to be, Sir,
Your most obedient servant,
B. H. Hodgson,
Member, Asiatic Society.

Read the following list of Books presented and purchased during the last month:—

Books received for the Meeting of the Asiatic Society, on the 1st of March, 1844.

Journal of the Bombay Branch Royal Asiatic Society, No. VI. October, 1843.—Presented by the Society.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the mouth of January, 1844.—From Government.

Naturalist's Library, Ichthyology, Vol. VI. British Fishes.—Purchased.

Naturalist's Library, Ornithology, Vol. XIV. British Birds.—Ditto.

The Calcutta Christian Observer, March, 1844.—Presented by the Editors.

The Annals and Magazine of Natural History, No. 81, January 1844.—Purchased.

Read the following copy of a letter to be dispatched to Messrs. W. and H. Allen by the next Steamer.

Messrs. Allen and Co.—Special.

Dear Sirs,—I am charged to press upon your immediate attention the following commission.

A bust of Mr. Brian Haughton Hodgson, B. C. S., having been voted by the Asiatic Society of Bengal, and that gentleman having left this country in the ship *Hardwicke* on the 7th instant, you are requested to place yourselves on receipt of this, in communication with Mr. Baily, Mr. Weekes, or Mr. Westmacott, the sculptors, or failing them, with the next eminent artist in sculpture, for the purpose of engaging his services for the work above noted. Having come to an understanding with the artist, I am charged by the Honorable the President and Members to request, that you will wait upon Mr. Hodgson on his arrival in England, (learning his address at Messrs. Coutts and Co.) and learn his wishes as to sittings for the bust,

You are requested to draw on the Society for advances and charges connected with the work, and the Honorable the President directs me to express his strong personal desire that you will gratify the Society by giving this matter your best attention.—Cost of the bust understood to be *not over* Guineas 150.

I am, &c.

Calcutta, 7th March, 1844. H. Torrens,
Vice President and Secretary Asiatic Society of Bengal.

Read the following letter from the Officiating Secretary to the Government of India, sanctioning payment for the copies of the reprint of Lieutenant (now Major) Leech's Beloochy and Brahooi Vocabulary and the over-copies of Capt. Eastwick's Scindee Vocabulary.

No. 131 of 1844.

From T. R. Davidson, *Esq. Officiating Secretary to the Government of India, to* H. Torrens, *Esq. Vice President and Secretary to the Asiatic Society.*

Sir,—In reply to your letter dated 26th ultimo, I am directed to inform you, that His Honor the President in Council has been pleased to pass the two bills submitted by Mr. Ridsdale of Bishop's College Press, amounting in the aggregate to Company's Rupees 124, for printing on account of Government, 150 copies of Lieutenant Eastwick's Vocabulary of the Scindee Language, and 150 copies of Lieutenant Leech's Grammar of the Brahuiky, Beloochee and Punjabee Languages. The necessary instructions will be issued through the Financial Department for the payment of that sum from the General Treasury to Mr. Ridsdale's receipt.

Foreign Department.

T. R. Davidson,

Fort William, 24th Feb. 1844. *Offg. Secy. to the Govt. of India.*

Read the following letter from the Secretary to the Royal Bombay Branch of the Asiatic Society :—

To the Secretary of the Asiatic Society of Bengal, Calcutta.

Sir,—With reference to my letter of the 7th September last, and by desire of the Bombay Branch of the Royal Asiatic Society, I have the honor to enclose bill of lading of a box shipped on board the *Framjee Cowasjee*, Captain Edwards, for Calcutta, containing copy of the Izashní and Visparad, of each of which 25 copies only have been lithographed at the expense of the Society, which you will be so good as to present to the Asiatic Society of Bengal. The box also contains 72 Geological specimens, some of which are of considerable interest.

The enclosed separate list will be of use in assisting the Curators in the arrangement of such of these specimens as may be found to deserve a place in the Museum, the fossils having been named with considerable care.

Another box will be prepared in a short time.

I have the honor to be, Sir,
Your most obedient servant,
John G. Malcolmson,

Bombay, Asiatic Society's Rooms, 9th Feb. 1844. *Secretary, B. B. R. A. S.*

Read the following letter from Moulmein; the book to which it refers was not obtained in time for the Meeting, having been sent to the Agricultural Society by mistake.

To the Librarian of the Asiatic Society, Calcutta.

Sir,—I do myself the honor of enclosing an order for a copy of the Maulmain Almanac and Directory for 1844, as also for a Plan of Maulmain, which I have been induced to compile in consequence of there being no work of the kind here, and the advantage it would be likely to confer upon the community, although a task of this nature is altogether out of my line of life.

Please accept of the work for the use of the Members of the Society.

I have sent it along with a few other copies to the care of Mr. Black, upon whom the order is.

I am, yours most obediently,
Geo. Eyre Barr.

P. S.—A few copies of the Work and Plan are sent for sale to Messrs. Ostell and Lepage.

Read the following letter from Dewan Horeemohun Sen, addressed to the Sub-Secretary: —

To H. Piddington, Esq. &c. &c. &c.

My dear Sir,—Here is a work compiled by Baboo Goorooprushad Roy, a very respectable gentleman and scholar. It is a Sanscrit and Bengalee Dictionary, or more properly speaking, an Encyclopedia, which has cost the author a great deal of labour and time, and much talent is, no doubt, displayed in it. The opinion passed upon this work by the learned Pundits here is highly favourable, as they consider it not only a very talented production, but particularly useful to persons learning Sanscrit and pure Shadhoo Bhasha Bengalee. I give him this note to you at his particular request; his object being to ask the favour of the Society's helping him, if convenient, to print and publish it for the benefit of those who apply themselves to the study of Sanscrit. He thinks that you can obtain for him some subscribers in Europe, where Sanscrit is held in estimation, such as France, Germany and England, &c. If you could therefore give him a helping hand, you would oblige,

Yours very sincerely,
Horeemohun Sen.

Bank of Bengal, the 14*th February*, 1844.

The specimen of the work accompanying the letter was thought highly satisfactory, and the Secretary was requested to make further enquiry as to the cost of printing, &c.

Read the following extract of a letter from V. Tregear, Esq., accompanying a Meteorological Table for 1843, kept at Pussewa near Jounpore.

My dear Sir,—I have the pleasure to send you a Meteorological Register kept at Pussewa, (12 miles east of Jounpore,) during the year 1843, which you may think worth putting in the Journal.

Jounpore, 14th February, 1844. Vincent Tregear.

The Table was referred to the Editors of the Journal.

The Secretary brought to the notice of the Meeting two books; viz.

British Moths and British Butterflies, by Westwood and Humphries, of which, at the request of the Zoological Curator, he recommended the purchase, which was sanctioned accordingly.

Read the following letter from the Curator Mineralogical and Geological Department:—

H. Torrens, Esq. *Vice President and Secretary, Asiatic Society.*

Sir,—I beg to represent to you the urgent want of two more cases for our Mineralogical, and two more for our Geological collections.

You have yourself witnessed the crowded state of our valuable Mineralogical Cabinet, and I may add, that I find it next to impossible to proceed with the heavy task of arrangement without the room in which to arrange. I have large stores to add yet to both the Mineralogical and Comparative Geological Cabinets, for which the four cases now applied for will be but barely sufficient, so that even with them, the utmost management will be required to do justice to our treasures.

I estimate the expense at about 60 Rs. each case, probably something below it.

H. Piddington,

Curator Museum Economic Geology and of Mineralogical and Geological Departments.

Museum, 6th March, 1844.

The purchase of the cases was sanctioned by the Meeting.

Read the following—

Report of the Curator Museum of Economic Geology and Geological and Mineralogical Departments.

We have but little to report upon this month, having had few contributions, and my own time being occupied with current arrangements, and with my report on the Cheduba specimens, which requiring many investigations, is not yet finished.

The Society will however hear with pleasure, the following letters from Government:—

No. 91.

From T. R. Davidson, Esq. *Offg. Secretary to the Government of India, to* H. Torrens, Esq., *Secretary to the Asiatic Society, dated the 27th Jan.* 1844.

Home Department.

Sir,—With reference to the application of the Asiatic Society, bearing date the 1st of July 1842, I am directed by the Honorable the President in Council to transmit to you the annexed copy, Paragraph 2, of a Despatch from

the Honorable the Court of Directors, No. 17 of 1843, dated the 1st November, together with Captain Herbert's Geological Map of the Mountain Provinces between the Sutlej and Kalee therein alluded to.

I am, Sir,
Your obedient servant,
T. R. DAVIDSON,
Offg. Secy. to the Govt. of India.

Council Chamber, the 27th Jan. 1844.

Extract from a Despatch from the Hon'ble the Court of Directors in the Public Department, dated the 1st November, 1842. *No.* 17.

Answer to Letter, dated 20th July, No. 32 *of* 1842.

Requesting the Court to send copies of Capt. Herbert's Geological Map, and 12 colored Views of the Himalayah for the use of the Asiatic Society.

2. We enclose as a number in the packet, a copy of Captain Herbert's Geological Map of the Mountain Provinces between the Sutlej and Kalee; but have not thought it necessary to incur the expense of procuring copies of the Views, which are large colored drawings of Scenery, and of no value in a scientific point of view.

(True Extract,)

T. R. DAVIDSON,
Offg. Secy. to the Govt. of India.

I have now the gratification of exhibiting the Geological Map to which it refers, and of congratulating the Society upon its having been able, through the kind attention of Government and the Honorable the Court of Directors, to render to the memory of one of their most zealous Members, and most earnest and laborious Indian men of science, Captain Herbert, full, though tardy justice; and in doing this also, it may claim at the same time to have rendered a most essential service to the cause of geological science, in giving to the world a connected Geological Map of this part of our great mountain barrier; for however deficient it necessarily is in details, and however much there may remain to be filled up, we have still here such a leading sketch of its main features by a scientific explorer, as will be invaluable to future observers; and I cannot better illustrate this opinion, than by requesting the attention of the Meeting to our two Geological Maps of England. The one but a little further improved than that of William Smith, the father of English Geology, after twenty years of assiduous and unassisted labour; and the other, Mr. Greenough's, the fruits of the combined knowledge and labours of all the geologists of England in twenty years more. It will be seen from these two examples how valuable, and in fact how indispensable, these preliminary sketches, like the first chalk or charcoal lines of the painter, are to the production of a finished work; and finally, we shall now, it is to be hoped, completely rescue Captain Herbert's labours from oblivion, (and even from misrepresentation,) and render justice to the liberality of the Government of India of that period in undertaking this great and most useful work.

Museum of Economic Geology.—We have received in this department, but without any letter, three sets of two Maps each, of the country through which the proposed

Rajmehal Canal is to pass, with the supposed limits of the Gangetic Alluvium. I do not know if any Geological Report was made on this interesting tract of country, hut shall not fail to enquire and to obtain its publication if possible.*

Mr. Black has obliged us with a Report on, and impressions from, the Lithographic Stones sent down by Captain Shortrede.

H. Piddington, Esq.

Dear Sir,—In reply to your note of this morning I beg to inform you, that Mr. Blechynden has received the copy of the Moulmain Almanac intended for the Asiatic Society's Rooms; and with reference to the Stones, I have pleasure in forwarding two proofs taken off from impressions on each, hut regret much I cannot give you so favorable an account of them as some of the former ones, as I find Nos. 1, 2, 3, 4, 5, 6 and 7 too soft, and No. 8 too hard, more resembling marhle. This last is one of the two you left with me, hefore those you left in the box. The little hlue piece is hy far too soft.

Asiatic Lithographic Press, Thos. Black.
No. 3, *Hare Street, 4th March,* 1841.

It would thus appear, that none of these are equal to the former fine specimen, as might well occur when a numher are taken at random from a heap of fragments quarried for building purposes; for in the German quarries also it is only from certain heds near Munich that the fine Stones are procured, and it is to this that, in part, their high price is owing. This matter however, is well worthy of a special recommendation to Government from the Society, since we are certain that a really good Stone exists, and have so near the spot an active, intelligent and zealous co-operator, like Captain Shortrede.

I have added to our collections specimens of the common Corundum Stone of the Bazar, with the powder of which all the cutting, grinding and polishing work of precious Stones is performed; even the Diamond is averred to he cut and polished by it, and it seems certain, that the use of Diamond powder is not known to the natives; or if known, that its expense prevents its adoption, or that the Indian lapidary finds his own process practically the best.

I find upon trial that the Corundum, would certainly cut every thing helow the Sapphire in hardness, and no douht *polish* the Sapphire, and I believe that if hetter known in Europe, it would he found of high value in the arts, and in many instances, (I speak here upon very competent authority,) reduce the prices of many very expensive processes, such as that of grinding hard steel pivots and plates, gems for lenses and the like, for which only Diamond powder can now he used, and the expense of this is often completely a prohihition on its employment, or adds enormously to the cost of the article. I have placed upon the tahle from our own collection nine specimens of the Stone, heginning with the Emery of Naxos, and ending with the crystallised rose Corundum of Ceylon.

* I have since learned from Colonel Forbes that no Geologist was attached to the Survey. Borings were made, and wells sunk along the line, and a series of specimens also collected from the adjacent rocks, *but it is not known what became of them!*

I have recommended a gentleman in this line of business, who left Calcutta a short time ago on the *Hindostan*, to take home a quantity of these stones for trial, and I have also ordered a quantity of them to be sent to England.

H. Piddington.

With reference to the suggestion of the Curator on the subject of Captain Shortrede's Lithographic Stones, the Secretary was requested to address Government on the part of the Society to that effect.

For all the foregoing presentations and communications the best thanks of the Society was voted.